未更新

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 Global Environmental Studies Associate Professor,HARADA EIJI		
Target year	2nd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Wed.5	Class style	Lecture	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).

[Evaluation methods and policy]

Term-end examination and attendance.

Continue to 工業数学B1（T1・T2）(2)↓↓↓

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	2020/Second semester
Days and periods	Fri.3	Class style	Lecture	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.

Continue to 工業数学B1（T3・T4）(2)↓↓↓

工業数学B1（T1・T2）(2)

[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.

工業数学B1（T3・T4）(2)

[Textbooks]

Instructed during class
None.

[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 Engineering Professor,ATOMI HARUYUKI Graduate School of Informatics Professor,KANDA TAKAYUKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year	4th year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Thu.3	Class style	Lecture	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.

[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]

Significance to learn engineering ethics. (4/11) 1time. As an introduction to this course, the meaning of engineering ethics and the significance to learning it are explained. Examples are shown in building engineering area on daily disastrous accidents and fire event. The significances of engineering ethics to those examples are discussed. (K. Harada: Architecture)
Geotechnical engineering and engineering ethics. (4/18) 1 time. Geotechnical Engineering is indispensable in discussing the underground public use, slope stability, geo-sequestration of byproduct for the energy generating. Introducing some examples of natural disasters and construction accidents, geotechnical engineering and engineering ethics will be discussed. (K. Kishida: Global Engineering)
Engineering ethics as an applied ethics. (4/25) 1 time. In this lecture, I will show the basic Idea of Engineering Ethics by comparing with the other fields of Applied Ethics. And show its unique character in the age of information technology. (M. Mizutani: Graduate School of Letters)
Ethical theories for engineering ethics. (5/2) 1 time. This lecture focus on various ideas in ethics (utilitarianism, deontology, virtue ethics, professional ethics etc.) which will be useful for thinking about particular ethical problems in engineering ethics. (T. Iseda: Graduate School of Letters)
Art-view concept for engineering. (5/9) 1time. Concept of "quality of life" is required for human related engineering. Some practical examples in medical-care and welfare fields will be introduced, and problem of the QOL-evaluation will be discussed from both function-optimizing view point and art view point. (N. Tomita: Engineering Science)
Ethics of biotechnology and stem cell research. (5/16) 1time. With the rapid development of genome editing technology and stem cell engineering, editing of the human genome that goes beyond generations has become possible, at least technically. In this lecture, I will introduce these latest technologies and think about ethical problems accompanying technological development. (G. Eiraku: Industrial Chemistry)
Research and engineering ethics. (5/23) 1time. It is said that He that will do no ill, must do nothing that belongs thereto. The sense of ethics necessary to whom conducts research and engineering work in society is discussed in terms of the importance of equitability and fair evaluation to anyone involved in each area of research or engineering. (H. Mikada: Global Engineering)
Ethics in biomedical engineering. (5/30) 1time. Recent dramatic progress in biology-related techniques, such as reproductive medicine, genome editing, and clone-animal techniques, is causing revolutions in the fields of

Continue to 工学倫理(2)↓↓↓

[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

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

medicines and food productions. Associated with it, problems of their safety and ethics are arising, which should be addressed by our societies. In this class, the recent progress in biology-related techniques, and problems we have and will have in near future are described. (M. Shirakawa: Industrial Chemistry)
Patents and ethics (Part 1). (6/6) 1time. This course will teach the students about 1) patent systems which protect inventions and research results and 2) ethical issues in patents. The first class, in preparation for the next subject of patent ethics, introduces Japan's patent system with comparisons to the patent systems in the world's major countries and international framework. (M. Nakagawa: Electrical and Electronics Engineering)
Patents and ethics (Part 2). (6/13) 1time. Students, equipped with the basic knowledge of patent systems by the previous lecture, will get familiar with actual case studies on ethical and legal issues in patents. (M. Nakagawa: Electrical and Electronics Engineering)
Ethics required for advanced science. (6/27) 1time. Engineers and researchers are at the forefront of preventing harm caused by advanced chemistry. Think about social roles and ethics required by engineers and researchers through relationships between chemical substances and environmental problems, efforts to avoid hazards of nanomaterials. (K. Miura: Industrial Chemistry)
Ethics in press release. (7/4) 1 time. Press Release is an essential process for introducing the research to our society through various medias. In this lecture, issues related to Press Release in University are addressed and discussed. (K. Umeno: Informatics and Mathematical Science)
Failure accidents and inspection/maintenance (7/11) 1time. On the occasions of failure accidents of vehicles and plants, the appropriateness of inspection/maintenance of their structures is often questioned. Some actual failure accidents are reviewed to discuss the importance of inspection/maintenance together with the relation to engineering ethics.(S. Biwa: Engineering Science)
Ethics in nuclear engineering. (7/18) 1time. Discussion on engineering ethics in the TEPCO accident from view point of Tsunami evaluation by the Japanese government. (I. Takagi: Engineering Science)
Ethical issues on sound design. (7/25) 1 time. Every working things consuming energy emits acoustic sound. Even a small sound energy affect human as noise and may create annoyance and health problems. Sound problems of various things are introduced in the lecture. Ethical issues, which shall be considered during design and operation environment, will be discussed. (Y. Takano: Architecture)

[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

Continue to 工学倫理(3)↓↓↓

Course number	U-ENG25 35148 LJ57　U-ENG25 35148 LJ75		
Course title (and course title in English)	職業指導 Vocational Guidance	Instructor's name, job title, and department of affiliation	Part-time Lecturer,INOUE　MAKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Intensive, First semester
Days and periods	Intensive	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

現代の日本は高学歴化が進み、学校教育において進学準備教育が重視される一方で、職業生活への移行にかかわる教育・訓練の機能は弱体化している。中等教育の目的の一つは、生徒の職業選択のための力量形成であり、さらに、専門高校では具体的な職業教育が行われてきた。本講義は、現代日本における職業教育の課題を理解するとともに、日本の専門高校における職業教育の実態を把握することを通じて、青年が生き方・働き方を主体的に選択できる教育とは如何なるものか、議論を深めることを目的とする。

[Course objectives]

・高校における職業教育の基本的な役割を理解する。
・国際比較の観点や労働市場との関係性をとおして、日本の高校職業教育の特徴を理解することができる。

[Course schedule and contents]

第1回　職業とは何か―その概念と種類
第2回　日本の学校における進路（職業）指導の起源と理論
第3回　学校と職業世界との接続(1)　日本的雇用システムと学校における進路指導の関係
第4回　学校と職業世界との接続(2)　日本の職業資格制度と学校教育
第5回　世界の職業教育―欧米における中等職業教育制度の特徴
第6回　技術・職業教育に関する国際的合意と日本の中等職業教育の位置
第7回　戦後の高校制度の性格と総合制―高校における職業教育の意義
第8回　専門高校における職業教育の実際(1)　進路指導のあり方と進路状況
第9回　専門高校における職業教育の実際(2)　職業資格・検定と専門教科の内容との関係
第10回　専門高校における職業教育の実際(3)　職場体験（インターンシップ）の実施と課題
第11回　日本の公的職業教育・訓練施設の種類と高校との接続関係
第12回　高等教育における職業教育―「専門職大学制度」の概要とこれから
第13回　日本におけるキャリア教育の提唱とその課題
第14回　日本の中等職業教育に関する課題の整理とその検討
第15回　総括・レポート試験

Continue to 職業指導(2)↓↓↓

職業指導(2)

[Course requirements]

None

[Evaluation methods and policy]

レポート試験の成績（60％）　平常点評価（40％）
平常点評価には、授業への参加状況、授業内での積極的発言を含む。

[Textbooks]

Instructed during class

[References, etc.]

（**Reference books**）
堀内達夫・佐々木英一・伊藤一雄・佐藤史人編『日本と世界の職業教育』（法律文化社）ISBN: 978-4-589-03511-0
佐藤史人・伊藤一雄・佐々木英一・堀内達夫編『新時代のキャリア教育と職業指導--免許法改定に対応して』（法律文化社）ISBN:978-4-589-03953-8

[Study outside of class (preparation and review)]

復習：授業で配布した資料等をよく読んで、講義内容の理解を深めておくこと。

（Other information (office hours, etc.)）

開講時期：令和2年8月26日（水）～8月31日（月）の土日を除く4日間の集中講義
各日ともⅠ時限～Ⅳ時限まで（8月28日（金）のみⅡ～Ⅳ時限）

*Please visit KULASIS to find out about office hours.

工学序論(2)

[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 22501 SJ77		
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 Senior Lecturer,OHTA HIROTO Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI
Target year	1st year students or above	Number of credits	1
Year/semesters	2020/Intensive, First semester		
Days and periods	Intensive	Class style	Lecture
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.

[Course requirements]

None

[Evaluation methods and policy]

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

Continue to 工学序論(2)↓↓↓

Course number	U-ENG23 23181 LJ73		
Course title (and course title in English)	ＧＬセミナーⅠ（企業調査研究） Global Leadership Seminar I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/Intensive, year-round		
Days and periods	Intensive	Class style	Seminar
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 expantion on the international market invesitgating 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

Continue to ＧＬセミナーⅠ（企業調査研究）(2)↓↓↓

GＬセミナーＩ（企業調査研究）(2)

[References, etc.]

（**Reference books**）

（**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

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-ENG23 33184 PJ73		
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	Approved

Target year	3rd year students or above	Number of credits	1	Year/semesters	2020/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	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)↓↓↓

Course number	U-ENG23 33182 LJ73		
Course title (and course title in English)	ＧＬセミナーＩＩ（課題解決演習） Global Leadership Seminar II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,OHTA HIROTO

Target year	2nd year students or above	Number of credits	1	Year/semesters	2020/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

This course is a small-group workshop program where students are supposed to extract or set up challenges by themselves aiming at creating new social values. In concrete, abilities of planning and problem-solving are trained through group works in residential training and skills of presentation and communication are enhanced through oral presentations regarding contents of the proposal at each step of the process from a preliminary draft to its completion.

[Course objectives]

Ability of planning, from extraction or setting up challenges to proposal of solutions aiming at creating new social values, is trained through group works.

[Course schedule and contents]

Orientation,1time,A brief overview and a schedule of the course are explained and working groups are organized.
Lectures,2times,Lectures by experts are given.
Group works,3times,Setting up challenges, extraction of problems, collecting information, and group works are done.
Residential training,7times,Through intensive group works based on discussion, a proposal for solving problems is planned, a draft report is made, and a few presentations are made.
Preliminary review meeting,1time,A preliminary review meeting is held and discussions are made.
Report meeting,1time,Final presentations are made and reports are submitted.

[Course requirements]

None

[Evaluation methods and policy]

It is required to join the residential training. A report meeting is held and comprehensive evaluation concerning abilities in group discussion to extract or set up challenges and to propose solutions for achieving a goal is made through presentation of the proposal as well as a submitted report.

Continue to ＧＬセミナーＩＩ（課題解決演習）(2)↓↓↓

GＬセミナーＩＩ（課題解決演習）(2)

[Textbooks]

Will be indicated as necessary.

[References, etc.]

（**Reference books**）
Will be indicated as necessary.

[Study outside of class (preparation and review)]

Will be indicated as necessary.

（**Other information (office hours, etc.)**）

Course open period: October to January
How to register the course will be instructed.
*It depends on divisions which students belong to whether the earned credits are admitted as credits required for graduation. Please refer to the syllabus of your division.

*Please visit KULASIS to find out about office hours.

[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-ENG27 37137 LE48　U-ENG27 37137 LE61		
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	Approved

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	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

未更新

Course number	U-ENG23 13001 LJ77　U-ENG23 13001 LJ73		
Course title (and course title in English)	地球工学総論 Introduction to Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MIMURA MAMORU Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA Graduate School of Engineering KANKEI KYOIN

Target year	1st year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Wed.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

Guidance,1time,
Safety and Engineering Ethics,1time,
General Lectures,5times,
Seminars,6times,
Laboratory Visit,2times,

[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 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 Global Environmental Studies Associate Professor,UEDA KAYO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Tue.3,4	Class style	Seminar	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
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

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)

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 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 Professor,NAKAKITA EIICHI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Tue.3,4	Class style	Seminar	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.

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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.

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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
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

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)

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 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 Professor,HORI TOMOHARU
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.3,4	Class style	Seminar
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
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The 13th - 14th Classes: Multivariate statistical analysis/regression analysis
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

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)

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]

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[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.)）

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*Please visit KULASIS to find out about office hours.

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,OONISHI MASAMITSU
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.3,4	Class style	Seminar
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
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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)

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]

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[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 13004 SJ10		
Course title (and course title in English)	情報処理及び演習(T1) Computer Programming in Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA Agency for Health, Safety and Environment Assistant Professor,YANO JUNYA
Target year	1st year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Thu.2	Class style	Seminar
Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,2times,
,2times,
,2times,
,4times,
,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 13004 SJ10		
Course title (and course title in English)	情報処理及び演習(T3) Computer Programming in Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI
Target year	1st year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.4	Class style	Seminar
Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,2times,
,2times,
,2times,
,4times,
,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 13004 SJ10		
Course title (and course title in English)	情報処理及び演習(T2) Computer Programming in Global 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	2020/Second semester		
Days and periods	Mon.1	Class style	Seminar
Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,2times,
,2times,
,2times,
,4times,
,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 13004 SJ10		
Course title (and course title in English)	情報処理及び演習(T4) Computer Programming in Global Engineering	Instructor's name, job title, and department of affiliation	Academic Center for Computing and Media Studies Professor,USHIJIMA SATORU Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI Academic Center for Computing and Media Studies Assistant Professor,TORIU DAISUKE
Target year	1st year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Thu.4	Class style	Seminar
Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,1time,
,2times,
,2times,
,2times,
,2times,
,4times,
,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 23005 LJ55		
Course title (and course title in English)	地球工学基礎数理（T1） Mathematics for Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Graduate School of Engineering Associate Professor,FURUKAWA AIKO
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Fri.1	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

-

[Course objectives]

-

[Course schedule and contents]

,7times,
,3times,
,4times,
,1time,

[Course requirements]

-

[Evaluation methods and policy]

-

[Textbooks]

Original text

[References, etc.]

（**Reference books**）
Not specified.

[Study outside of class (preparation and review)]

Preview and review the original text

（Other information (office hours, etc.)）

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*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23005 LJ55		
Course title (and course title in English)	地球工学基礎数理（T3） Mathematics for Global 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 Associate Professor,HIRAI YASUHIRO
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Fri.1	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

-

[Course objectives]

-

[Course schedule and contents]

,7times,
,3times,
,4times,
,1time,

[Course requirements]

-

[Evaluation methods and policy]

-

[Textbooks]

Original text

[References, etc.]

（**Reference books**）
Not specified.

[Study outside of class (preparation and review)]

Preview and review the original text

（Other information (office hours, etc.)）

-

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23005 LJ55		
Course title (and course title in English)	地球工学基礎数理（T2） Mathematics for Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SAWAMURA YASUO Disaster Prevention Research Institute Associate Professor,YOKOMATSU MUNETA
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Fri.1	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

-

[Course objectives]

-

[Course schedule and contents]

,7times,
,3times,
,4times,
,1time,

[Course requirements]

-

[Evaluation methods and policy]

-

[Textbooks]

Original text

[References, etc.]

（**Reference books**）
Not specified.

[Study outside of class (preparation and review)]

Preview and review the original text

（Other information (office hours, etc.)）

-

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23005 LJ55		
Course title (and course title in English)	地球工学基礎数理（T4） Mathematics for Global 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	2020/First semester		
Days and periods	Fri.1	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

-

[Course objectives]

-

[Course schedule and contents]

,7times,
,3times,
,4times,
,1time,

[Course requirements]

-

[Evaluation methods and policy]

-

[Textbooks]

Original text

[References, etc.]

（**Reference books**）
Not specified.

[Study outside of class (preparation and review)]

Preview and review the original text

（Other information (office hours, etc.)）

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*Please visit KULASIS to find out about office hours.

未更新

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,KIYONO JIYUNJI Graduate School of Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,YAGI TOMOMI Graduate School of Engineering Associate Professor,KITANE YASUO Graduate School of Engineering Associate Professor,FURUKAWA AIKO
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.1,2	Class style	Seminar
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]

Introduction, 1 time, Structures and elements, Purpose and application scope of structural mechanics, Assumptions, Examples related to engineers' ethics
Properties of forces, 1 time, External forces, Modeling of external forces, Force equilibrium conditions, Static determinate, static indeterminate and unstability
Sectional forces, 9 time, Equilibrium of free body, Sectional forces, Sectional forces on differential portion, Axial force, Flexural moment and shear force, Torsion moment, Influence lines
Stress, 2 times, Stress: force per unit area, Stresses and coordinate system
Displacement and deformation, 6 times, Displacement, Deformation, Strain, Curvature and torsional ratio
Sectional properties, 2 times, Geometrical moment of area, Moment of inertia of area
Stress and strain, 2 times, Hooke's Law, Sectional force and deformation, Sectional modulus
Calculation of displacement,4 times, Element in tension/compression, Deflection of beam, Deflection of truss, Statically determinate and indeterminate structures
Buckling of column,2 times, Buckling phenomenon, Euler's buckling load, Eccentrically compressive column
<<Confirmation of the attainment level of learning, Confirm the attainment level of learning>>
Feedback, 1 time

[Course requirements]

calculus A and B

Continue to 構造力学Ⅰ及び演習(2)↓↓↓

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,SAITOU JIYUN
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.2	Class style	Lecture
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, 2 times,
Simple harmonic motion, Eigenvalue and eigenvector, Vector calculus

Laws of motion, 3 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

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, 2 times,
Center of Mass, Conservation of Momentum, coupled oscillations and their mode

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.

Continue to 一般力学(T1・T2)(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.

一般力学(T1・T2)(2)

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]

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

[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

[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 T3 and T4 class students can take the class.

*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(T3・T4) Fundamental Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA

Target year	2nd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Mon.4	Class style	Lecture	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,
Constraint condition, constraint force, generalized coordinate, generalized force, Lagrange's equations.

Continue to 一般力学(T3・T4)(2)↓↓↓

Course number	U-ENG23 23013 LJ73		
Course title (and course title in English)	水理学及び演習 Hydraulics and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Management Professor,TODA KEIICHI Graduate School of Engineering Professor,HOSODA TAKASHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI Disaster Prevention Research Institute Associate Professor,KAWAIKE KENJI Disaster Prevention Research Institute Associate Professor,YONEYAMA NOZOMU

Target year	2nd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Wed.3,4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

Systematic understanding of fundamental hydraulics through exercises

[Course schedule and contents]

<Lecture(Lec) 90minutes:1 time, Exercises(Ex) 90minutes:0.5 times>

●Fluid Statics, Buoyancy, Flotation Stability [Lec:1time, Ex:1time]:
Hydrostatic pressure, buoyancy force, stability of floating body are explained and their exercises are implemented.

●Elementary Fluid Dynamics [Lec:2times, Ex:1.5 times]:
Continuum dynamics, control volume method, continuum equation, momentum equation and one-deimensional analysis are explained and their exercises are implemented.

●Potential Flows [Lec:1time, Ex:0.5 times]:
Bernoulli's theorem and two-dimensiional irrotational flow is explained and their exercises are implemented.

●Viscous Flow and Turbulence [Lec:2times]:
Deformation stress, Navier Stokes equation, shear stress for laminar flow and frictional loss, laminar and turbulent flow and velocity distribution of turbulent flow are explained.

●Comprehensive Exercise [Ex:1time]:

Continue to 水理学及び演習(2)↓↓↓

一般力学(T3・T4)(2)

Confirmation of achievement, 1 time
Examination

[Course requirements]

Elementary calculus and linear algebra

[Evaluation methods and policy]

Examination: 85%, Weekly assignment: 15%

[Textbooks]

Worksheet (in Japanese) is provided via web.

[References, etc.]

（**Reference books**）

（**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.

*Please visit KULASIS to find out about office hours.

水理学及び演習(2)

Comprehension check regarding to each term is implemented.

●Intermediate examination:
Intermediate examination is carried out.

●Dimensional Analysis, Similitude [Ex:0.5 times]:
Dimensional analysis, pi-theorem and similarity rule are explained and their exercises are implemented.

●Viscous Flow in Pipes [Lec:2times, Ex:1time]:
Energy equation, frictional law, form drag loss, siphon and pipe flow are explained and their exercises are implemented.

●Open-Channel Flow [Lec:3times, Ex:2times]:
Energy equation, momentum equation, open channel equation, specific energy, specific force, hydraulic jump and analysis of gradually varied flow are explained and their exercises are implemented.

●Achievement confirmation:
Comprehension check of course contents.

●Feedback

[Course requirements]

Differential and integral calculus, linear algebra etc., standard mathematics of general education course, and Dynamics and electromagnetism etc., standard physics of general education course

[Evaluation methods and policy]

Based on the results of examinations

[Textbooks]

Handout is used in the Lectures and Exercises.

[References, etc.]

（**Reference books**）

Non

（**Related URLs**）

(Non)

[Study outside of class (preparation and review)]

Review the lecture contents.
Prepare the exercises questions and review them.

Continue to 水理学及び演習(3)↓↓↓

水理学及び演習(3)

（Other information (office hours, etc.)）

Lecture is opened along with exercise. How to contact with instructors is announced during lecture and exercise.

*Please visit KULASIS to find out about office hours.

環境衛生学(2)

[Course requirements]

None

[Evaluation methods and policy]

In principle, the results will be evaluated based on attendance (about 10%) and a written test (about 90%).

[Textbooks]

Others; to be introduced from time to time during the lecture.

[References, etc.]

（Reference books）

Others; to be introduced from time to time during the lecture.

[Study outside of class (preparation and review)]

If knowledge of high school biology is insufficient, it is considered desirable to review every time. No particular preparations are necessary.

（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 13014 LJ15　U-ENG23 13014 LJ90		
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 Global Environmental Studies Professor,TAKANO HIROHISA Graduate School of Global Environmental Studies Associate Professor,UEDA KAYO
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Thu.1	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

Hygiene and public health are academic disciplines for protecting people's lives and health, and they are also related to many other disciplines. On the other hand, it should not be forgotten that "the manufacturing" in engineering may have secondary effects on living beings, including humans, as well as the environment. In these lectures, the focus is on the relationship of basic matters of hygiene and public health and recent knowledge with the environment, which should be studied in the Faculty of Engineering.

[Course objectives]

Extensively learning the basic knowledge related to environmental health (hygiene), hygiene, and public health, which will serve as the foundation for citizens who are conscious of their responsibility toward the next generation, life, and the Earth, or as highly professional specialists who contribute to the development of related fields.

[Course schedule and contents]

Health, illness, its prevention, and environmental factors (1 time): The concept of health and illness (disease) and their relationship with environmental factors will be explained, and concepts on the prevention of illness and health effects will also be studied.
Environmental toxicology (3 times): Lectures will be given on the health effects of environmental factors from a toxicological viewpoint, focusing on pharmaco(toxico)kinetics of exogenous material (environmental pollutants, etc.), metabolism/excretion, and so forth.
Health effects of environmental pollutants (2 times): The health effects of environmental pollutants will be explained, focusing on the problems of pollution by chemical substances and air pollution, while taking up actual examples.
Ecological impact of environmental pollutants (1 time): The structure and characteristics of the ecosystem and the impact of environmental pollutants on the ecosystem will be explained, while taking up actual examples.
Pollution and global environmental problems (1 time): Pollution and global environmental problems will be explained, focusing on introducing past cases and the current situation.
Environment and biological response/immunity (2 times): The biological response against exogenous material will be explained focusing on the immune system, and the impact of environmental pollutants on the immune system will be studied. Additionally, the sick house syndrome and so forth will be covered.
Epidemiology and environmental epidemiology (4 times): In order to evaluate the health risk of environmental pollutants, an environmental epidemiological approach to human population is essential. The necessary statistical methods, appropriate exposure assessment, confounding factors, and so forth for that purpose will be studied.
Confirmation of learning achievement and feedback (1 time): Confirming the level of comprehension of lecture contents. Additionally, questions can be asked and answered.

Continue to 環境衛生学(2)↓↓↓

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 Engineering Professor,SHIMIZU YOSHIHISA Graduate School of Engineering Associate Professor,MATSUDA TOMONARI
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Tue.1	Class style	Lecture
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.

Continue to 環境生物・化学(2)↓↓↓

環境生物・化学(2)

[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).）

[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.

材料学(2)

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 Atsushi Hattori at rm C1-218, Katsura, Takashi Yamamoto at rm C1-456, Katsura and/or Satoshi Takaya at rm C1-454, Katsura are welcome.

*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 Associate Professor,HATTORI ATSUSHI Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.2	Class style	Lecture
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
Corrosion of reinforcing steel, carbonation, chloride induced corrosion are introduced.
12. Mix design of concrete

Continue to 材料学(2)↓↓↓

未更新

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 Associate Professor,HATTORI ATSUSHI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.2	Class style	Lecture
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.

[Evaluation methods and policy]

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

Continue to コンクリート工学(2)↓↓↓

コンクリート工学(2)

[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.

水文学基礎(2)

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, report, and the final examination.

[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 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 Engineering Professor,TACHIKAWA YASUTO Graduate School of Advanced Integrated Studies in Human Survivability Professor,TAKARA KAORU Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.5	Class style	Lecture
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]

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 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.
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

Continue to 水文学基礎(2)↓↓↓

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	2020/Second semester		
Days and periods	Wed.2	Class style	Lecture
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 hydrologic frequency analysis, distribution functions used for the frequency analysis, and estimation methods of parameters of a distribution function is described.

Continue to 水資源工学(2)↓↓↓

水資源工学(2)

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.

測量学及び実習(H26以前入学者)(2)

Error adjustment,4times,The methodology to adjust the errors in the traverse survey is introduced, and the student will learn how to obtain the most probable parameters through the exercise.
Photogrammetry,2times,The overview of photogrammetry is introduced, and the practice using the instrument is conducted.
GPS survey,3times,The theory of GPS and GPS survey are introduced, and the practice of GPS survey is conducted.
Evaluation of understanding,1time,The student will be evaluated for their understanding of the contents offered by the course.

[Course requirements]

Linear Algebras, Mathematical Statistics

[Evaluation methods and policy]

Evaluate considering the scores of the intermediate and final examinations, and the reports and attendance of the field exercise.

[Textbooks]

Masayuki Tamura and Junichi Susaki, quotSurveyingquot (in Japanese) isbn{}{9784621087480}

[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 33040 PJ73		
Course title (and course title in English)	測量学及び実習(H26以前入学者) Surveying and Field Practice	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI Graduate School of Engineering Associate Professor,SUSAKI JIYUNICHI Graduate School of Engineering Assistant Professor,KAWABATA YUICHIRO Graduate School of Engineering Assistant Professor,KIMURA YUUSUKE Graduate School of Engineering Assistant Professor,SEGI SHUNSUKE Graduate School of Engineering Assistant Professor,NAKAO SATOSHI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Fri.2,3,4	Class style	Practical training
Language of instruction	Japanese		

[Overview and purpose of the course]

Lectures and field practice of the surveying are conducted. In the lectures, survey techniques, details on the instruments, adjustment of the errors contaminated in the measured data are introduced. In the field practice, the student will understand the survey procedure using the instruments.

[Course objectives]

The student will understand the background and theory to reduce the errors contaminated in the measured data and to estimate the reliable parameters.
The student will be able to derive the most probable value and standard error using the least square method and the law of error propagation.
The student will understand the purpose of the various kinds of survey.
In the field exercise, the student will acquire the preparedness to plan the survey and the attitude to cooperate with other students for the accomplishment of the survey.

[Course schedule and contents]

Introduction of survey,1time,The purpose, history and content of the surveys are introduce. In addition, the survey applications and the advanced technology of the surveys are also introduced.
Distance and angular measurement,3times,Distance and angular measurement, simple and fundamental surveys, are introduced. The student will learn how to set the instrument properly, and the technique to measure the angles using theodolite.
Control survey,8times,The survey plan for the control survey is introduced, and the practice of the traverse survey, one of the most traditional control surveys, is conducted.
Leveling,3times,The methodology of leveling and the adjustment of the errors are introduced, and the practice is conducted.
Plane survey and topographic survey,4times,The methodology of the plane survey and topographic survey is introduced. The features of the topographic map produced through the survey are explained.
Theory of errors,2times,The concept of the errors and the law of the error propagation are introduced.
Least square method,3times,The concept of the least square method (LSM), popular approach to the processing of the survey data, is introduced. The student will learn how to apply the LSM for the practical application through the exercise.

Continue to 測量学及び実習(H26以前入学者)(2)↓↓↓

Course number	U-ENG23 33044 LJ73 U-ENG23 33044 LJ55 U-ENG23 33044 LJ24		
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,OONISHI MASAMITSU
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Thu.1	Class style	Lecture
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

都市・地域計画(2)

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 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 Management Associate Professor,OOBA TETSUHARU Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.4	Class style	Lecture
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)
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

Continue to 都市・地域計画(2)↓↓↓

未更新

Course number	U-ENG23 33046 LJ73		
Course title (and course title in English)	河川工学 River Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOSODA TAKASHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Disaster Prevention Research Institute Associate Professor,TAKEMON YASUHIRO
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Wed.1	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

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

[Course objectives]

To learn the basic knowledge to consider river environments from the various points of view such as flood control, natural environment conservation, water utilization based on natural sciences, social sciences and engineering amp technology.

[Course schedule and contents]

Various viewpoints on rivers and river basins,1time,Various viewpoints on rivers and river basins, Vvrious rivers and their landscapes on the Earth, formation processes of river basins, long term environmental changes of rivers and main factors
Precipitation, water cycle and run-off phenomena,1time,Basic knowledge on Meteorology, Water Resources, Statistical Hydrology of precipitation and Rain Fall Run-off Analysis
River flow and river channel processes,2times,Basics on unsteady open channel flows and flood flow simulation, sediment transport in alluvial rivers, formation processes of meso-scale and micro scale sand waves, etc.
Application of numerical hydraulics to environmental issues,1time,Relation between the behavior of an endangered bird called #039Kamogawa-Chidori#039 and sand-bar formation, Mechanism on DO depletion near the bottom of the northern part of Lake Biwa due to the climate changeon the earth, Dam reservoir sedimentation due to sediment run-off from a catchment area, etc.
Structure and functions of river and lake eco-system,3times,(1) Hierarchical structure and classification of river ecosystems, Relations between river geomorphology and habitat structure, Classification of microhabitats and their maintenance mechanisms, Longitudinal distribution of biological communities (2) Function of river ecosystems, Roles of biodiversity, Sustainable conditions of habitats for biological communities, Mass transfer mechanism in rivers, Nutrient spiraling, Impact assessment of river environments and Physical Habitat Simulation Model (3) Function of lake ecosystems, Classification of natural lakes and ponds by thermal stratification and thermal convection, Relations between lake types and biota (fauna and flora), Characteristics of man-made reservoir ecosystems
Integrated river basin planning,3times,(1) River law, Fundamental river management plan, River improvement plan, Procedures to make a flood control planning (2) Flood invasion analysis and Hazard Map, Excessive floods and comprehensive flood disaster prevention measures, River structures(groines and levees)

Continue to 河川工学(2)↓↓↓

河川工学(2)

(3) Cost-Benefit Analysis of flood control projects, Evaluation of peoplersquos awareness to river improvement projects by means of CVM and Conjoint Analysis in view of flood control, water utilization and natural environmental conservation
Integrated river basin planning,3times,(1) River environmental improvement plan, Normal discharge, River restoration projects, Environmental assessment, etc. (2) Classification of river structures and their functions, Impact assessment for construction of dam reservoirs and estuary barrages, etc. (3) Comprehensive management of sediment outflow and sediment budgets in river basins, concepts of recent sediment control dams, asset management of dam reservoirs, management of sediment dynamism for integrated river planning, etc.
Achievement confirmation(feedback),1time,Achievement of learning is confirmed.

[Course requirements]

Elementary knowledge of Hydraulics, Hydrology and Ecology

[Evaluation methods and policy]

Mainly regular examination. Quiz in a class, attendance and report submission are also considered for grading to some extent.

[Textbooks]

Printed materials on the contents will be circulated in each lecture.

[References, etc.]

（**Reference books**）

（**Related URLs**）

(http://www.geocities.jp/kyoto_u_rivereng/)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

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

*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 Engineering Associate Professor,ECHIGO SHINYA Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.2	Class style	Lecture
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, and future prospects of water quality management are stated.

Continue to 上水道工学(2)↓↓↓

未更新

Course number	U-ENG23 33053 LJ14　U-ENG23 33053 LJ73		
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,FUJII SHIGEO Graduate School of Global Environmental Studies Associate Professor,TANAKA SHUHEI Graduate School of Engineering Associate Professor,NISHIMURA FUMITAKE Graduate School of Asian and African Area Studies Associate Professor,HARADA HIDENORI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.2	Class style	Lecture
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.

上水道工学(2)

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 LJ73　U-ENG23 33055 LJ16		
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 Engineering Professor,TANAKA HIROAKI Graduate School of Engineering Associate Professor,NISHIMURA FUMITAKE Graduate School of Engineering Senior Lecturer,HIDAKA TAIRA Graduate School of Engineering Assistant Professor,TAKEUCHI HARUKA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Mon.1	Class style	Lecture	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[3 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.

(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.

Continue to 下水道工学(2)↓↓↓

下水道工学(2)

(6)New perspective of sewerage system[1 week]:
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 Professor,YONEDA MINORU Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Tue.2	Class style	Lecture	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 usage of various radiation measuring devices.

Continue to 放射線衛生工学(2)↓↓↓

放射線衛生工学(2)

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]

Not used
Handout will be given at each lecture.

[References, etc.]

（**Reference books**）

[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 LJ16　U-ENG23 33058 LJ17		
Course title (and course title in English)	廃棄物工学 Solid Waste Management	Instructor's name, job title, and department of affiliation	Agency for Health, Safety and Environment Professor,SAKAI SHINICHI Agency for Health, Safety and Environment Associate Professor,HIRAI YASUHIRO
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.3	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

This course is designed to study measures used to manage waste generated by household and industrial activities in cities and towns. Students will learn basic and 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#8212Clean, Cycle, and Control#8212as they relate to hazardous waste and international management systems. We will also introduce strategic case examples for controlling 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 pertaining to 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. Hierarchical Measures for MSW, 5times
We will explain the waste management hierarchy and elucidate the processes of waste prevention, reuse, recycling, bioconversion, thermal conversion, and final disposal in light of their benefits and limitations. Students will learn how the techniques and systems are adopted in practice in Japan and some Western countries.

2. Definitions of Hazardous Waste and the 3Cs (Clean, Cycle, Control) Concept, 2times
We will discuss the Basel Convention, OECD hazardous waste management, and specially controlled waste systems in Japan, with a particular emphasis on the definitions of hazardous waste in these regulations. As an effective hierarchical measure used in hazardous waste management, we will examine the 3Cs concept. While keeping the Clean and Cycle aspects in mind, we will take a closer look at the Control aspect, which focuses on the maximum reduction of emissions of hazardous substances into the environment and stabilizing hazardous substances used in products by decomposition as much as possible. Students will learn from studying case examples related to asbestos.

Continue to 廃棄物工学(2)↓↓↓

廃棄物工学(3)

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

廃棄物工学(2)

3. Definitions of Waste, Laws and Regulations for Waste Classification, Analysis of Waste Composition, 1time
Students will study the objectives and current problems of waste management, as well as the definitions of waste and laws/regulations related to waste classification. Special attention will be paid to the analysis of waste composition and interpretation of MSW composition data.

4. Resource Consumption and Waste Generation, 2times
We will study the relationships between resource consumption and waste generation from the viewpoint of material flow in nature and human society. We will examine indices for resource consumption (e.g., the amount of direct input of resources, hidden flow, ecological footprint, and environmental carrying capacity), classification of the patterns of waste generation, major products and their useful lifespans, resource yield, and transitions in waste amounts and characteristics.

5. MSW Generation and Collection, and Payment and Collection Methods for MSW Disposal, 2times
We will target MSW to examine waste flow in depth, including separate collection by local governments, collection by residents, collection and trade-ins by manufacturers and dealers, and purchase by secondhand stores. We will also study MSW management plans and the breakdown of waste disposal costs together with collection and payment methods.

6. Appropriate MSW Management and Assessment of Environmental Burdens due to Waste Disposal, 2times
We will introduce Life Cycle Assessment (LCA) and Risk Assessment as effective tools for evaluating the environmental impacts of waste disposal. Referring to case examples, we will study the outlines of these tools. Students will also gain an understanding of the application of assessment techniques for hazardous waste and standard criteria for waste disposal.

7. Students’ Learning Outcomes, 1time
Students’ level of understanding of course topics will be checked.

[Course requirements]

None

[Evaluation methods and policy]

Evaluating method: test scores, 70%; report paper and attendance rates, 30%.

[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.

Continue to 廃棄物工学(3)↓↓↓

未更新

Course number	U-ENG23 33059 LJ73　U-ENG23 33059 LJ16　U-ENG23 33059 LJ76		
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 Assistant Professor,TAKASHI FUJIMORI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Wed.2	Class style	Lecture
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

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

Continue to 環境装置工学(2)↓↓↓

環境装置工学(2)

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	2020/Second semester		
Days and periods	Thu.1	Class style	Lecture
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]

[Textbooks]

[References, etc.]

（**Reference books**）

Continue to 分離工学(2)↓↓↓

未更新

Course number	U-ENG23 33076 LJ72　U-ENG23 33076 LJ77		
Course title (and course title in English)	工業計測 Measurement Systems	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TSUKADA KAZUHIKO
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Wed.1	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

Configulations and Characteristics of Measurement Systems,2times,
Physics on Transducers,2times,
Measurement of Fundamental Physical Quantities,4times,
Transformation and Recording of Signals,2times,
Statictical Processing of Data,2times,
Modern Instrumentation,2times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（**Reference books**）

（**Related URLs**）

(http://www.kumst.kyoto-u.ac.jp/kougi/instrm/)

[Study outside of class (preparation and review)]

（**Other information (office hours, etc.)**）

*Please visit KULASIS to find out about office hours.

分離工学(2)

[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	Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA Disaster Prevention Research Institute Associate Professor,YOKOMATSU MUNETA Graduate School of Engineering Assistant Professor,SEGI SHUNSUKE
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Thu.2	Class style	Lecture
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
Externality (1 time): The generation mechanism of externality and its types, and the internalization policy of externality will be explained. Text 14.1

Continue to 公共経済学(2)↓↓↓

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 Associate Professor,HATTORI ATSUSHI Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.3,4	Class style	Experiment
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)↓↓↓

公共経済学(2)

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.

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.

未更新

Course number	U-ENG23 33087 EJ73		
Course title (and course title in English)	水理実験 Experiments on Hydraulics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Management Professor,TODA KEIICHI Graduate School of Engineering Professor,HOSODA TAKASHI Disaster Prevention Research Institute Professor,MORI NOBUHITO Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI Disaster Prevention Research Institute Associate Professor,KAWAIKE KENJI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,TAKEBAYASHI HIROSHI Disaster Prevention Research Institute Associate Professor,TANAKA KENJI Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Disaster Prevention Research Institute Associate Professor,YONEYAMA NOZOMU Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Assistant Professor,IKARI HIROYUKI Graduate School of Engineering Assistant Professor,OKAMOTO TAKAAKI Graduate School of Engineering Assistant Professor,Yuma Shimizu Graduate School of Global Environmental Studies Assistant Professor,田中　智大 Academic Center for Computing and Media Studies Assistant Professor,TORIU DAISUKE Disaster Prevention Research Institute Assistant Professor,NOHARA DAISUKE Disaster Prevention Research Institute Assistant Professor,MIYASHITA TAKUYA Disaster Prevention Research Institute Assistant Professor,Yamanoi Kazuki
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Thu.3,4	Class style	Experiment
Language of instruction	Japanese		

Continue to 水理実験(2)↓↓↓

水理実験(3)

[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.

水理実験(2)

[Overview and purpose of the course]

Guidance of laboratory experiments in hydraulics and measurement instruments.
Eight experiments are conducted about pipe flow, open-channel flow, waves, flow in porous media, density flow, hydrodynamic force, sediment transport

[Course objectives]

Understanding hydraylic phenomena through various flows observed in the hydraulic laboratory

[Course schedule and contents]

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

[Course requirements]

Hydraulics and Exercises

[Evaluation methods and policy]

Attendance : 40 points
Reports and homework : 60 points
total : 100 points

[Textbooks]

Continue to 水理実験(3)↓↓↓

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 KANKEI KYOIN
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.1	Class style	Lecture
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 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.

Continue to 建築工学概論<地球>(2)↓↓↓

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

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)↓↓↓

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 Engineering Professor,KIMURA MAKOTO Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Engineering Associate Professor,HIGO YOUSUKE
Target year	3rd year students or above	Number of credits	3
Year/semesters	2020/First semester		
Days and periods	Wed.1,2	Class style	Seminar
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)↓↓↓

(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 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	Graduate School of Engineering Professor,KIYONO JIYUNJI Disaster Prevention Research Institute Professor,IGARASHI AKIRA
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.1	Class style	Lecture
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 normal vibration modes.

Continue to 波動・振動学(2)↓↓↓

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.

波動・振動学(2)

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)↓↓↓

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,HOSODA TAKASHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,HIGO YOUSUKE Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.3	Class style	Lecture
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.

基礎環境工学Ⅰ(2)

[Course requirements]

None

[Evaluation methods and policy]

Breakdown of grading: paper tests results (60%) and attendance (40%).
Short tests are also conducted for grading.

[Textbooks]

Printed materials are distributed in class.

[References, etc.]

（**Reference books**）

Ministry of the Environment 『Annual Report on the Environment in Japan』
Graduate School of Global Environmental Studies, Kyoto University (ed.)『Global Environmental Studies, Learning of Way of Thinking from Several Points of View and Ability to Solve Problems, Kyoto University Popular Lecture Series』（Maruzen）ISBN:9784621088074

[Study outside of class (preparation and review)]

To follow guide of the staffs.

（Other information (office hours, etc.)）

Contents and the number of lectures are a guide. Question time is prepared at individual lectures.
Please confirm the information on the details of office hours via KULASIS.

*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 23132 LJ17　U-ENG23 23132 LJ16		
Course title (and course title in English)	基礎環境工学Ⅰ Fundamental Environmental Engineering I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.4	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

To study fundamentals of Environmental Engineering which is responsible for the solutions of environmental problems in academic frameworks of Global Engineering. The contents of the class are overview of environmental engineering, global environmental problems and protection of atmospheric environment, protection of water environment and water supply and sewage systems, management of environmental risk, development of society of material cycles and technologies of waste management, and global environment and health. Lectures are given by staffs of Environmental Engineering Course and specialists of other organizations. Basic theories and practice of Environmental Engineering are provided.

[Course objectives]

To understand influence of human activities on environment and environment-related issues, and to study fundamentals of environmental engineering.

[Course schedule and contents]

(1) Global environmental problems and protection of atmospheric environment (3 times):
Histories and mechanisms of global environmental problems, design of low carbon society, current situation of atmospheric environment, and their control measures.

(2) Protection of water environment and water supply and sewage systems (3 times):
Framework and function of water environment, factors of water pollution and mechanism, change of water quality, pollutions of river, lake and marine and their mechanisms, technologies for protection of water environment, fundamentals of water supply and sewage systems.

(3) Management of Environmental risk (3 times):
Procedures of risk identification, risk analysis, quantitative risk assessment, and risk management.

(4) Development of society of material cycles and technologies of waste management (3 times):
Design of society of material cycles, generations of general and industrial wastes and their factors, waste treatment technologies, waste reduction.

(5) Global environment and health (2 times):
Effects of change of global environment on human health and control measures for them.

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

Continue to 基礎環境工学Ⅰ(2)↓ ↓ ↓

未更新

Course number	U-ENG23 23133 LJ28　U-ENG23 23133 LJ77		
Course title (and course title in English)	資源エネルギー論 Resources and Energy	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Energy Science Associate Professor,KUSUDA HIROMU
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.3	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,6times,
,5times,
,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 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 Disaster Prevention Research Institute Professor,TATANO HIROKAZU Graduate School of Management Associate Professor,OOBA TETSUHARU Graduate School of Engineering Assistant Professor,KAWABATA YUICHIRO Graduate School of Engineering Assistant Professor,NAKAO SATOSHI
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.1,2	Class style	Seminar
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]

[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.

水理水工学(2)

[Evaluation methods and policy]

Attendance, reports and final examination

[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 33136 LJ73		
Course title (and course title in English)	水理水工学 Hydraulics and Hydrodynamics	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,TODA KEIICHI Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.2	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

Lecture of fundamental theories of fluid dynamics and applications to hydraulic engineerging
Basic equations, potential flow theory, boundary layer theory and turbulent flow Introduction of basic modelings about fluid motion and heat transfer in atmosphere related to hydrology and meteorology

[Course objectives]

Learning elementary knowledge of hydraulics and important topics of hydrodynamics science

[Course schedule and contents]

Open channel flow (1) ,1time,Basic equations of non-uniform flow, longitudinal profile
Open channel flow (2) ,1time,Non-uniform flow computation
Unsteady pipe flow,1time,Basic equations of unsteady pipe flow, application to water hummer phenomenon and surge tank
Unsteady open-channel flow,1time,Basic equations of unsteady open-channel flow, theories of flood flow and hydraulic bore
Introduction of fluid dynamics (1),1time,Boundary theory and application to hydraulic engineering
Introduction of fluid dynamics (2),1time,Primer of turbulence theory and application to hydraulic engineering
Applied hydraulics (1) ,1time,Seepage flow and its analysis
Applied hydraulics (2) ,1time,Fundamentals of sediment transport
Applied hydraulics (3) ,1time,Sediment related topics of rivers
Hydrometeorology (1) ,1time,Introduction to hydrometeorology
Hydrometeorology (2) ,1time,Thermodynamics of atmosphere, Dry-adiabatic process
Hydrometeorology (3) ,1time,Vertical stability of atmosphere for infinitesimal displacement
Hydrometeorology (4) ,1time,Moisture in atmosphere, Moist-adiabatic process
Hydrometeorology (5) ,1time,Latent instability, Land surface process of atmosphere
Achievement confirmation,1time,Achievement of learning is confirmed.

[Course requirements]

Hydraulics and Exercises

Continue to 水理水工学(2)↓↓↓

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 Graduate School of Management Associate Professor,KIMOTO SAYURI Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Engineering Associate Professor,HIGO YOUSUKE Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,KITAOKA TAKAFUMI Graduate School of Engineering Assistant Professor,KIDO RYUNOSUKE Graduate School of Engineering Assistant Professor,SAWADA MAI Disaster Prevention Research Institute Assistant Professor,UEDA KYOHEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Wed.3,4	Class style	Seminar
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)↓↓↓

Course number	U-ENG23 33139 LJ73　U-ENG23 33139 LJ16		
Course title (and course title in English)	基礎環境工学II Fundamental Environmental Engineering II	**Instructor's name, job title, and department of affiliation**	Graduate School of Global Environmental Studies Professor,KATSUMI TAKESHI Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Professor,SHIMIZU YOSHIHISA Graduate School of Engineering Professor,YONEDA MINORU

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2020/First semester
Days and periods	Tue.1	**Class style**	Lecture	**Language of instruction**	Japanese

[Overview and purpose of the course]

The focus is on the management of the geosphere environment, and the management system based on environmental standards and so forth; the history and current state of pollution in Japan, pollution mechanisms and the characteristics of soil and groundwater, a model for pollution evaluation, pollution investigation methods, and soil rehabilitation technology will be explained. With respect to various kinds of purification and rehabilitation technologies, actual purification and rehabilitation cases will be introduced, and the principle, characteristics, and problems will be explained. Additionally, the movement mechanism of water and materials in bedrock will be explained.

[Course objectives]

Protecting the soil and groundwater that is closely related to the geosphere environment, especially our lives, from contamination, and understanding the knowledge that is the basis for thinking rationally and for the engineering techniques needed for the theory and background management. Understanding how to grasp the current state of the geosphere environment and the basics for predicting the future of pollution, and also developing applied skills for designing a method of managing the geosphere environment on your own.

[Course schedule and contents]

History of soil pollution and governing equation (2 times): The historical background and current situation of soil and groundwater pollution in Japan will be introduced, and how Japan has responded to these problems, the setting of environmental standard values, the current situation of legal regulation, future issues, and so forth will be introduced. In addition, the governing equation that describes the behavior of pollutants in the soil will be outlined.

Movement mechanism of water and materials in the soil and physical measures (3 times): The following contents will be explained:
1. Hydrology and permeability coefficient in the soil (type of soil and permeability coefficient and permeability of multilayered ground); 2. characteristics and effects of waterproofing material, underground walls, and clay barriers; and 3. hydraulic characteristics of unsaturated soil and capillary barriers.

Organic pollution mechanism and measures (3 times): We explain the characteristics of soil and sorption/ desorption reactions, which are important for the bioremediation of soil contaminated with organic matter.

Mechanism and countermeasures of inorganic pollution (3 times): The relation with pH and oxidation-reduction potential, the stoichiometric equilibrium theory, the ionization tendency, and so forth which are necessary for understanding the mechanism of inorganic contamination will be explained.

Continue to 基礎環境工学II(2)↓↓↓

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

基礎環境工学II(2)

Movement mechanism of substance in underground layers (3 times): As examples of relationship between geoenvironment and society, geological disposal of high level radioactive waste and naturally occurring heavy metal pollution in underground layers will be taken up and their physical, chemical and geological features will be explained.

[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 score or the final examination. The score of some reports will be also considered, if some are given by lectures.

[Textbooks]

Not used
Handout will be given at each lecture.

[References, etc.]

（**Reference books**）
Introduced during class

[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 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 Associate Professor,FUJIMORI SHINICHIRO
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.1	Class style	Lecture
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.
Confirmation of understanding,1time,Confirm the understanding

Continue to 大気・地球環境工学(2)↓↓↓

未更新

Course number	U-ENG23 33141 EJ14　U-ENG23 33141 EJ73		
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,FUJII SHIGEO Graduate School of Global Environmental Studies Associate Professor,TANAKA SHUHEI Graduate School of Engineering Associate Professor,NISHIMURA FUMITAKE Graduate School of Engineering Senior Lecturer,HIDAKA TAIRA Graduate School of Engineering Senior Lecturer,NAKADA NORIHIDE Graduate School of Asian and African Area Studies Associate Professor,HARADA HIDENORI
Target year	3rd year students or above	Number of credits	3
Year/semesters	2020/First semester		
Days and periods	Mon.3,4,5	Class style	Experiment
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]

Continue to 環境工学実験1(2)↓↓↓

大気・地球環境工学(2)

[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

環境工学実験1(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.

[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,TAKUDA HIROHIKO Graduate School of Engineering Professor,TSUKADA KAZUHIKO 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,MIKADA HITOSHI Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Energy Science Associate Professor,KUSUDA HIROMU
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.3	Class style	Lecture
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)↓↓↓

未更新

Course number	U-ENG23 33147 PJ73　U-ENG23 33147 PJ16　U-ENG23 33147 PJ17		
Course title (and course title in English)	学外実習(土木工学コース) Spot Trainning	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Intensive, Second semester		
Days and periods	Intensive	Class style	Practical training
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)↓↓↓

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

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 PJ73　U-ENG23 33147 PJ16　U-ENG23 33147 PJ17		
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	2020/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training	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 business diary during the internship, a report about outcome of the internship, and presentation after the internship.

[Textbooks]

Not used
No textbook.

[References, etc.]

（**Reference books**）

Continue to 学外実習(環境工学コース)(2)↓↓↓

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	Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI Graduate School of Engineering Associate Professor,SUSAKI JIYUNICHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Thu.2	Class style	Lecture	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)↓↓↓

学外実習(環境工学コース)(2)

[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 about one month 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.

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)]

（**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 Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Disaster Prevention Research Institute Professor,IGARASHI AKIRA Disaster Prevention Research Institute Professor,SAWADA SUMIO Graduate School of Engineering Associate Professor,KITANE YASUO Graduate School of Engineering Associate Professor,SAITOU JIYUN Graduate School of Engineering Associate Professor,FURUKAWA AIKO Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,GOI YOSHINAO Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.4,5	Class style	Seminar
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

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

Continue to 構造実験・解析演習(2)↓↓↓

構造実験・解析演習(2)

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 Ⅰand Exercises, Structure mechanics Ⅱ 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 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 Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.3	Class style	Lecture
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 (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

Continue to 耐震・耐風・設計論(2)↓↓↓

耐震・耐風・設計論(2)

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 Graduate School of Engineering Professor,KIMURA MAKOTO Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Tue.2	Class style	Lecture
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.

[References, etc.]

（**Reference books**）

Continue to 地盤環境工学(2)↓↓↓

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
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.3	Class style	Lecture
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}.

Continue to 交通マネジメント工学(2)↓↓↓

地盤環境工学(2)

[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

交通マネジメント工学(2)

[References, etc.]

（**Reference books**）

[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 EJ16　U-ENG23 33154 EJ76　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 Professor,YONEDA MINORU Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI Graduate School of Engineering Associate Professor,YOKO SHIMADA Agency for Health, Safety and Environment Associate Professor,MATSUI YASUTO Graduate School of Engineering Assistant Professor,KUSAKABE TAKETOSHI Graduate School of Engineering Assistant Professor,GOMI RYOUTA Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO Graduate School of Engineering Assistant Professor,TAKASHI FUJIMORI Graduate School of Energy Science Assistant Professor,YAMAMOTO KOUHEI Institute for Integrated Radiation and Nuclear Science Assistant Professor,IKEGAMI MAIKO

Target year	3rd year students or above	Number of credits	3	Year/semesters	2020/Second semester
Days and periods	Tue.3,4,5	Class style	Experiment	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.

Continue to 環境工学実験2(2)↓↓↓

環境工学実験2(3)

[Textbooks]

Textbook for the experiments is delivered in class.

[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

環境工学実験2(2)

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

5th Class: Report writing
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

Continue to 環境工学実験2(3)↓↓↓

未更新

Course number	U-ENG23 33155 LJ71　U-ENG23 33155 LJ77　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 Professor,MIKADA HITOSHI Graduate School of Engineering Assistant Professor,XU Shibo Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Mon.4	Class style	Lecture	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 simulate wave phenomena.
Check of Progress , 1 times,Furthermore, the degree of study achievement is checked about whether an

Continue to 波動工学(2)↓↓↓

波動工学(2)

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 33157 EJ77		
Course title (and course title in English)	資源工学材料実験 Materials testing for mineral science and technology	Instructor's name, job title, and department of affiliation	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 Associate Professor,HAMA TAKAYUKI Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA Graduate School of Energy Science Assistant Professor,CHIN YUUSEI
Target year	3rd year students or above	Number of credits	1
Year/semesters	2020/Second semester		
Days and periods	Wed.3,4	Class style	Experiment
Language of instruction	Japanese		

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

Orientation,1time,The course goals, schedule of this class, and various attention for safety are presented.
Material testing and failure criterion of rock,4.5times,Overview of the rock material testing, the method to obtain Young#039s modulus, Poisson#039s ratio, uniaxial compressive strength, and tensile strength are explained. First, in this theme, rock specimen is prepared. Second, uniaxial compression test is conducted. During the uniaxial compression test, strain measurement using strain gauges is performed, and the uniaxial compressive strength, Young#039s modulus and Poisson#039s ratio are determined. Third, Brazilian test is conducted and the tensile strength is determined. Finally, the failure criterion of the specimen is determined.
Tensile test and mechanical properties of sheet metals,4.5times,Overview of the testing for sheet metals is explained. A uniaxial tensile test of steel and aluminum alloy sheets is conducted, and then the stress-strain curves and the mechanical properties are evaluated.
Metallographic observation and petrographic observation,4.5times,The metallographic observation for metal specimens and the petrographic observation for rock specimens are conducted. At the first step, observation procedures including how to use a microscope are explained. In the metallographic observation, every group makes a specimen and observes the metal crystal. In the petrographic observation, every student observes the thin sections of rocks using a petrographic microscope and learns how to identify minerals and rocks on thin sections.

[Course requirements]

It is desirable that students take the quotExperimental Basics in Earth Resources and Energy Science, Laboratoryquot offered in the previous semester. It is also desirable to take quotMaterials and Plasticityquot, quotRock Engineeringquot, and quotGeological and Geophysical Survey, Field Excavationquot of the

Continue to 資源工学材料実験(2)↓↓↓

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,TAKUDA HIROHIKO Graduate School of Energy Science Professor,FUJIMOTO HITOSHI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.2	Class style	Lecture
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.

資源工学材料実験(2)

Undergraduate Course Program of Earth Resources and Energy Engineering that are offered in the same semester.

[Evaluation methods and policy]

Students are divided into several groups. Every student is asked to conduct the experiments and microscopic observation with group members and to make an experimental report individually for every theme. Grading is made by the attitudes to the experiments and the grade points of every experimental report. The grading weights of them are even.

[Textbooks]

This course does not specify a textbook. Lecture documents may be deribered from teachers in each experimental theme.

[References, etc.]

（**Reference books**）
Not specified

（Related URLs）

(This course does not have a web site.)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33159 LJ28　U-ENG23 33159 LJ77		
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	2020/First semester		
Days and periods	Mon.1	Class style	Lecture
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]

[Textbooks]

[References, etc.]

（**Reference books**）

Continue to 地殻海洋資源論(2)↓↓↓

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 Engineering Professor,MIMURA MAMORU Graduate School of Management Associate Professor,KIMOTO SAYURI Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Engineering Associate Professor,HIGO YOUSUKE
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Tue.3,4	Class style	Seminar
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 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.

Continue to 土質力学Ⅰ及び演習(2)↓↓↓

地殻海洋資源論(2)

[Study outside of class (preparation and review)]

（**Other information (office hours, etc.)**）

*Please visit KULASIS to find out about office hours.

土質力学Ⅰ及び演習(2)

[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

未更新

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 Engineering Professor,KAWASAKI MASASHI Graduate School of Engineering Associate Professor,YAMAGUCHI KEITA
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Wed.3,4	Class style	Lecture
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)↓↓↓

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	2020/First semester		
Days and periods	Mon.4,5	Class style	Seminar
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,Introduction\Work, virtual work and energy\Castiglianorsquos theorems and principle of minimum potential energy\Virtual work and complementary virtual work\Principle of virtual work (virtual displacement)\Principle of complementary virtual work(virtual force)\Reciprocal theorems
Static determinate and indeterminate,1time,Degree of freedom and degree of indeterminacy
Solutions to statically indeterminate structures,6times,Introduction of force method and displacement method\By equations of elasticity\By displacement method
Structural stability,3times,Stability criteria\Deformation of rigid body-elastic spring system\Deformation of elastic beam- column system
Basis of matrix method of structural analysis,4 times,Matrix adapted to equilibrium equations/displacement conditions\Analysis 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

[Course requirements]

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

Continue to 構造力学II及び演習(A班)(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.

構造力学II及び演習(A班)(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 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 mechanics Ⅱ, Maruzen Ltd. isbn{}{4621046403}

[Study outside of class (preparation and review)]

（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	Disaster Prevention Research Institute Professor,SAWADA SUMIO
Target year	3rd year students or above	Number of credits	3
Year/semesters	2020/First semester		
Days and periods	Mon.4,5	Class style	Seminar
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.

Continue to 構造力学II及び演習(B班)(2)↓↓↓

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	2020/First semester		
Days and periods	Mon.4,5	Class style	Seminar
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.

Continue to 構造力学II及び演習(C班)(2)↓↓↓

構造力学II及び演習(B班)(2)

[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 mechanics Ⅱ, Maruzen Ltd. isbn{}{4621046403}

[Study outside of class (preparation and review)]

（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.

構造力学II及び演習(C班)(2)

[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 mechanics Ⅱ, Maruzen Ltd. isbn{}{4621046403}

[Study outside of class (preparation and review)]

（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,TAKUDA HIROHIKO Graduate School of Energy Science Professor,FUJIMOTO HITOSHI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.3	Class style	Lecture
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.

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	Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Fri.1	Class style	Lecture
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
Second order partial differential equations with infinite domain
are discussed as the applications of Fourier transform.

Continue to 工業数学B2(土木工学コース)(2)↓↓↓

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	2020/First semester		
Days and periods	Wed.3	Class style	Lecture
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.

工業数学B2(土木工学コース)(2)

+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 LJ77　U-ENG23 33174 LJ55		
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,TSUKADA KAZUHIKO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Tue.2	Class style	Lecture	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.

岩盤工学(土木工学コース)(2)

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]

[References, etc.]

（**Reference books**）
Society of Materials Science, Japan: Rock Mechanics isbn{}{4765516288}

[Study outside of class (preparation and review)]

（**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 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,OOTSU HIROYASU Graduate School of Engineering Professor,KISHIDA KIYOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Tue.1	Class style	Lecture	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 construtions of tunnels in the mountain region and representative shield method for tunneling at city area are also explained. Simple design exercises and special lecture from experienced person

Continue to 岩盤工学(土木工学コース)(2)↓↓↓

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	2020/Second semester
Days and periods	Tue.1	Class style	Lecture	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 will be conducted; in addition, discussions on the observation results will be carried out.

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)

[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

地球工学デザインA(2)

[Course requirements]

It is desirable to have taken the class of quotUrban and Landscape Designquot. It is expected to have mastered basic knowledge of quotStructural Mechanicsquot and quotConstruction Materialsquot.

[Evaluation methods and policy]

Total points will be scored in attitude of attendance (40%) and results of design practice and reports (60%).

[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, C1-1 at Katsura Campus). The theme of design practice could be changed partially.

*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 43177 LJ73		
Course title (and course title in English)	地球工学デザインA Design Exercise for Global Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KAWASAKI MASASHI Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Graduate School of Engineering Associate Professor,YAMAGUCHI KEITA Part-time Lecturer,NAGAHAMA NOBUTAKA Part-time Lecturer,YAGI HIROKI
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.3,4	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

In this course, the name of which represents the ldquoCivil Engineering Design,rdquo the process and methodology to integrate an engineering aspect and an aesthetic aspect of design of civil engineering facilities will be provided through a design exercise of a footbridge. In this course, structural engineering, material science, and landscape design will be considered to be unified. Before that, planning issues such as a flow plan, pedestrian traffic, width of the walkway etc. will be introduced. Through the design exercise, students acquire a viewpoint of integration contained in designing civil engineering facilities, and find a domain of design that can be done and should be done by civil engineers. Moreover, we will have special lectures by 3 practitioners who are active in the front line.

[Course objectives]

To understand the process and methodology to integrate an engineering aspect and an aesthetic aspect of design of civil engineering facilities through a design exercise of a footbridge. To come in touch with the front line of civil engineering design. Students are expected to get design-mindsets as civil engineers in the end.

[Course schedule and contents]

Outline of Civil engineering design,1time,Guidance \ Outline of Civil engineering design: design and architecture, idea and image of design, shape and scale, method of design.
Civil engineering design exercise,8times,Through a design exercise, students execute a design process: the field survey, arrangement of conditions, planning, creating ideas, structural analysis, detailed study, drawing, model making, and presentation. Then, a mature design is proposed with the consideration of integration of basic knowledge of civil engineering.
Front line of civil engineering design,5times,Lectures and design practices by 3 professionals who are working on the front line of civil engineering design. In addition, we will have a talk session with the lecturers about various topics.
Feedback,times,Achievement of learning is confirmed.

Continue to 地球工学デザインA(2)↓↓↓

Course number	U-ENG23 43178 LJ77		
Course title (and course title in English)	地球工学デザインB Design Exercise for Global Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Energy Science Professor,TAKUDA HIROHIKO Graduate School of Energy Science Professor,FUJIMOTO HITOSHI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI Graduate School of Energy Science Associate Professor,KUSUDA HIROMU Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA Graduate School of Energy Science Associate Professor,HAMA TAKAYUKI Graduate School of Engineering Associate Professor,MURATA SUMIHIKO Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA Graduate School of Energy Science Assistant Professor,KUSAKA EISHI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Energy Science Assistant Professor,CHIN YUUSEI
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Fri.3,4	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

Two courses (a, b) are opened in parallel.
In the course (a), the aim is understanding theories of numerical simulation, and carrying out the simulation analysis. Lectures on simulation theory and analysis are conducted with exercises.
In the course(b), lectures and exercises on basic knowledge related to resources and energy are conducted.

[Course objectives]

Course (a): getting skill solving problems using simulation, and presentation technique.
Course (b): getting basic knowledge on resources and energy.

[Course schedule and contents]

a-1. Simulation Theory and Introduction of Each Theme, 3 times, Explanations of theories of numerical simulations analysis, and each theme for students.
a-2. Simulation exercise, 6 times, Students carry out numerical simulation analysis based on each theme.
a-3. Interim report, 1 time, Each student explains their own theme, and reports the method and the progress.
a-4. Simulation exercise, 4 times, Continue simulation analysis for each theme.
a-5. Presentation of final results, 1 time, Summary of the analysis results, and the presentation.

Continue to 地球工学デザインB(2)↓↓↓

地球工学デザインB(2)

b-1. Deformation and Strength of Metallic Material, 4～6 times, Learning deformation behavior and strength characteristics of metallic materials from the dislocation theory, and also basic knowledge on the relationship between macroscopic behavior and factors in deformation. Exercise on fundamental problems related to them.
b-2. Observation and Analysis of Minerals, 4～6 times, Observations and Analysis of production and dissolution of methane hydrate using microscope. Observation rock minerals, rock texture, micro-cracks. Knowledge of rock minerals.
b-3. Numerical analysis of thermal fluid, 3～5 times, Explanation of finite difference method for estimation of numerical solution of thermal fluid. Programming exercise.
b-4 Confirmation of achievement, 1 time, Confirmation of students knowledge.
In the Course (b), Professors in charge of each theme will decide the number of lecture and exercise according to the degree of students' understanding. The total number of them is 15 times.

[Course requirements]

In the course (a), it is desirable to complete the subjects relating Computer Programming and Informatics.
In the course (b), it is desirable to complete the next subjects, Physical Chemistry, Materials Testing for mineral science and technology, Materials and Plasticity, and Resources and Energy.

[Evaluation methods and policy]

In the course (a), the half of scores is based on student's presentation with discussion, the rest is from student's reports.
In the course (b), the score is based on student's daily study attitude and reports.

[Textbooks]

It will be shown in the lectures. Printed materials will be also provided.

[References, etc.]

（**Reference books**）
It will be shown in the lectures.

[Study outside of class (preparation and review)]

It will be shown in the lectures.

（**Other information (office hours, etc.)**）

Details are explained at the guidance.

*Please visit KULASIS to find out about office hours.

地球工学デザインC(2)

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
No textbook.
Printed materials are distributed in class.

[References, etc.]

（**Reference books**）

Continue to 地球工学デザインC(3)↓↓↓

未更新

Course number	U-ENG23 33179 LJ73　U-ENG23 33179 LJ16		
Course title (and course title in English)	地球工学デザインC Design Exercise for Global 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 Engineering Associate Professor,ECHIGO SHINYA Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO Graduate School of Engineering Assistant Professor,TAKASHI FUJIMORI
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Wed.3,4	Class style	Lecture
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.

Basic design of sewerage system (2 times)
Update status of design of sewerage system, and methodologies to determine placement and capacity of

Continue to 地球工学デザインC(2)↓↓↓

地球工学デザインC(3)

[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.

未更新

Course number	U-ENG23 33200 LJ77　U-ENG23 33200 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,TAKUDA HIROHIKO Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Energy Science Associate Professor,HAMA TAKAYUKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,3times,
,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.

社会基盤デザインⅠ(2)

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 13501 LE14　U-ENG23 13501 LE73		
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 Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Management Professor,TODA KEIICHI Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Thu.2	Class style	Lecture	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.
Hydraulics and Hydrology,3times,In order to resolve various problems caused　by the rapid change of global environment, it is important to understand the formation processes of river basins in the world and the development processes of cities located along a river. Several river basins with well-known cities are introduced including the natural conditions, history amp culture developed for many years. The Kyoto city, which is famous for a complicated water channel network system, is of course considered as a typical example.
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.
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.

Continue to 社会基盤デザインⅠ(2)↓↓↓

未更新

Course number	U-ENG23 13502 SE73		
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 Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Engineering KANKEI KYOIN

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Tue.5	Class style	Lecture	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

[Evaluation methods and policy]

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

[Textbooks]

Distribute printed materials as needed

Continue to 社会基盤デザインⅠⅠ(2)↓↓↓

社会基盤デザインＩＩ(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.

[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

測量学及び実習(H27以降入学者)(2)

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。
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]

船型代数学、数理統計学

[Evaluation methods and policy]

測量学の中間・期末試験を中心に実習レポート、出席状況等を総合的に勘案して行う。

[Textbooks]

田村正行・須崎純一『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.)**）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG27 37226 LE61　U-ENG27 37226 LE48		
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,UNO NOBUHIRO Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI Graduate School of Engineering Associate Professor,SUSAKI JIYUNICHI Graduate School of Engineering Assistant Professor,KAWABATA YUICHIRO Graduate School of Engineering Assistant Professor,KIMURA YUUSUKE Graduate School of Engineering Assistant Professor,SEGI SHUNSUKE Graduate School of Engineering Assistant Professor,NAKAO SATOSHI

Target year	3rd year students or above	Number of credits	3	Year/semesters	2020/First semester
Days and periods	Fri.2,3,4	Class style	Practical training	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、最確値や標準誤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。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。

Continue to 測量学及び実習(H27以降入学者)(2)↓↓↓

未更新

Course number	U-ENG23 33187 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2020/First semester
Days and periods	Wed.4	Class style	Seminar	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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Stephen Gill
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/First semester		
Days and periods	Wed.5	Class style	Seminar
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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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	Part-time Lecturer,Stephen Gill Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/First semester		
Days and periods	Thu.4	Class style	Seminar
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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Stephen Gill
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/First semester		
Days and periods	Thu.3	Class style	Seminar
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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Karin L. Swanson
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/First semester		
Days and periods	Thu.3	Class style	Seminar
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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Karin L. Swanson
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/First semester		
Days and periods	Thu.4	Class style	Seminar
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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Stephen Gill
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/Second semester		
Days and periods	Mon.5	Class style	Seminar
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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Stephen Gill
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/Second semester		
Days and periods	Mon.4	Class style	Seminar
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 LJ58　U-ENG23 33187 LJ10　U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Karin L. Swanson
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/Second semester		
Days and periods	Thu.3	Class style	Seminar
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 LJ58 U-ENG23 33187 LJ10 U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Karin L. Swanson
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/Second semester		
Days and periods	Thu.4	Class style	Seminar
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 LJ58 U-ENG23 33187 LJ10 U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Stephen Gill
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/Second semester		
Days and periods	Thu.4	Class style	Seminar
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 LJ58 U-ENG23 33187 LJ10 U-ENG23 33187 LJ77		
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,MATSUSHIMA KAKUYA Part-time Lecturer,Stephen Gill
Target year	2nd year students or above	Number of credits	1
Year/semesters	2020/Second semester		
Days and periods	Thu.3	Class style	Seminar
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.

Course number	U-ENG23 33539 LE73		
Course title (and course title in English)	海岸工学 Coastal Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI Graduate School of Engineering Assistant Professor,IKARI HIROYUKI Graduate School of Engineering Assistant Professor,Yuma Shimizu
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.4	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

Introduction to Coastal Engineering[1time]:
Introduction to coastal engineering with focusing on beach deformation

Small Amplitude wave theory[2times]:
Characteristics of small amplitude wave theory and its application are explained.

Wave Statistics / Wave Transformation[2times]:
Developing process of wind wave and expression method of irregular waves are explained. Mechanics of wave transformation is outlined.

Wave Force on Coastal Structures[1time]:
Several experimental formulae of wave force acting on coastal structures are introduced. Problems for stability of rubble mound is mentioned.

Design of Coastal Structures (Exercise)[1time]:
Exercise of design of coastal structures.

Introduction to Computational Design of Coastal Structures[1time]:
State-of-the-art numerical wave flume and its applications are explained.

Sediment Hydraulics[4times]:
Sediment hydraulics (i.e., basic characteristics, calculation of river-bed, bed load and suspended load, non-equilibrium sediment transport) is explained.

Continue to 海岸工学(2)↓↓↓

海岸工学(2)

Nearshore Current / Coastal Sediment Transport[1time]:
Near-shore current due to wave deformation and resultant coastal sediment transport are outlined.

Tsunami and Storm Surge: Evacuation Planning under Coastal Disasters[1time]:
Characteristics of tsunami and storm surge are explained. Additionally, evacuation process and evacuation planning are introduced.

Achievement confirmation[1time]:
Comprehension check of course contents.

Feedback

[Course requirements]

To have already completed the class of Hydraulics and Exercises is desirable.

[Evaluation methods and policy]

Based on the results of examinations

[Textbooks]

Handout is used in the lectures as needed.

[References, etc.]

（**Reference books**）
Supplemental textbook is announced in the first lecture.

（**Related URLs**）
(Non)

[Study outside of class (preparation and review)]

Review the lecture contents.

（**Other information (office hours, etc.)**）

Reexamination is not provided.
How to get in touch with instructors is announced in the first lecture.

*Please visit KULASIS to find out about office hours.

資源情報解析学(2)

Spatio-temporal data analysis (3 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 (4 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.

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

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG25 45171 LJ71		
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 Professor,MIKADA HITOSHI Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.4	Class style	Lecture
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 models, which are representative analysis methods, in order to find inherent regularity from time series data and to enable future prediction.

Continue to 資源情報解析学(2)↓↓↓

Course number	U-ENG23 33210 SJ77　U-ENG23 33210 SJ54		
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,TSUKADA KAZUHIKO Graduate School of Engineering Associate Professor,MURATA SUMIHIKO
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Wed.2	Class style	Lecture
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 view applying fracture mechanics and solid mechanics.

[Course objectives]

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

[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 (Hooke's law and practical elastic modulus,
Stress/strain tensor, crystal structure and symmetry)
3rd: Stress/strain and elasticity (Crystal system and elastic constant)
4th: Mechanical properties of atomic bonds and solids (bond strength between atoms, Types of atomic bonds, Ionic crystal and Madelung constant)
5th: Mechanical properties of atomic bonds and solids (Covalent bond,
Interatomic potential and physical properties)
6th: The latticed spring model of elastic body (Coordinate transformation and apparent Young's modulus),
Theoretical strength of perfect crystal
7th: Intermediate examination
8th: Brittle fracture and ductile fracture (Characteristics of brittle fracture and ductile fracture,
Griffith's fracture theory for brittle material)
9th: Linear fracture mechanics (Deformation mode, Stress field and displacement field
in the vicinity of the crack tip, Stress intensity factor, Strain energy release rate)
10th: Nonlinear fracture mechanics (J integral, Crack opening displacement)
11th: Fracture toughness and fatigue (Fracture toughness value, Fracture toughness test,
Mechanism of fatigue, Fatigue life)
12th: Crack and Fracture in mixed mode (Crack propagation and destruction criteria
in mixed mode of mode I + mode II and mode I + mode II + mode III)
13th: Mechanical model of composite material (Voigt model, Reuss model, Intermediate model of Voigt model and Reuss model, Eshelby's equivalent inclusion method)

Continue to 固体の力学物性と破壊(2)↓↓↓

固体の力学物性と破壊(2)

14th: Rheology model (Macro rheology model, Micro rheology model)
15th: Examination
16th: Feedback class (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 a report problem is given in every class. The grade is evaluated by the sum of scores of the quiz or the report and the final exam. The grading weights of them are 30% and 70% respectively.

[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.

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. Midterm exam and final exam are also presented. 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 33220 EJ77		
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,TSUKADA KAZUHIKO Graduate School of Engineering Associate Professor,MURATA SUMIHIKO
Target year	3rd year students or above	Number of credits	4
Year/semesters	2020/First semester		
Days and periods	Mon.1,2	Class style	Lecture
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 explained.

[Course objectives]

One objective of this course is to master the basis to solve the boundary value problems in linear elasticity analytically or numerically. Another one is 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, Mohr's stress circle, Invariant of stress
3rd: Displacement and strain, Coordinate transformation of strain, Invariant of strain, Mohr's strain circle
4th: Relationship between stress and strain, Elastic modulus,
Basic equations of elasticity in rectangular coordinate system,
Elastic basic formula in polar coordinate system
5th: Airy's stress function in rectangular coordinate system,
Two-dimensional elastic problem using Airy's stress function
6th: Various Airy's stress function in rectangular coordinate system
7th: Airy's stress function in polar coordinate system,
Two-dimensional elastic problem using Airy's stress function in polar coordinate system
8th: Two-dimensional elastic problem using Airy's stress function in polar coordinate system
9th: Intermediate examination
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
(Approximate solution based on the principle of virtual work and principle of minimum potential energy)
14th: Approximate solution based on variational principle
(Introduction to finite element method)
15th: Finite element method for elastic problems, Feedback class
16th: Examination

Continue to 弾性体の力学解析(2)↓↓↓

Course number	U-ENG24 14072 PJ74		
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 Engineering Professor,FUKUYAMA EIICHI Graduate School of Energy Science Associate Professor,HAMA TAKAYUKI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Mon.1,2	Class style	Seminar
Language of instruction	Japanese		

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,3times,
,2times,
,3times,
,4times,

[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-ENG25 35203 LJ77　U-ENG25 35203 LJ52　U-ENG25 35203 LJ28		
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,TSUKADA KAZUHIKO Graduate School of Engineering Professor,MIKADA HITOSHI Graduate School of Energy Science Associate Professor,KUSUDA HIROMU Graduate School of Engineering Associate Professor,NARA YOSHITAKA Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA Graduate School of Energy Science Assistant Professor,KUSAKA EISHI Graduate School of Engineering Assistant Professor,XU　Shibo Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Thu.3,4,5	Class style	Experiment	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]

Continue to 資源工学基礎実験(2)↓↓↓

未更新

Course number			
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 Professor,MIKADA HITOSHI Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA Graduate School of Engineering Assistant Professor,XU　Shibo Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Energy Science Assistant Professor,CHIN YUUSEI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Tue.3,4,5	Class style	Experiment	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. The data acquired is analyzed using the quotstripping methodquot, and used for estimating the subsurface

Continue to 資源工学フィールド実習(2)↓↓↓

資源工学基礎実験(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.

資源工学フィールド実習(2)

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.

未更新

Course number	U-ENG23 33260 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 KOUKI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.3	Class style	Lecture
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 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 (3 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

Continue to 地質工学(2)↓↓↓

未更新

Course number	U-ENG25 25172 LJ75		
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,MIKADA HITOSHI Graduate School of Engineering Associate Professor,NARA YOSHITAKA Graduate School of Engineering Associate Professor,MURATA SUMIHIKO
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Tue.2	Class style	Lecture
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 a synthetic research areas being covered in this academic domain.

[Course schedule and contents]

General introduction to earth resources problems,1time,The discussion is on how the earth resources engineering has developed after the industrial revolution in a chronological way with a special interest to the relations with earth sciences such as geology, geophysics, and many other engineering fields.
Deposit Geology,4times,The following is discussed: 1) earth#039s history, generation of igneous and hydrothermal deposits, sedimentary deposit, diagenesis, and hydrocarbon deposits, 2) Conventional hydrocarbon deposits and the current development situation, 3) non-conventional hydrocarbon deposits and the current development situation, 4) Ore and mineral deposit science for iron, base metal, rare metal and nonmetallic resources and the current development situation.
Exploration Geophysics,3times,Exploration geophysics for the development of hydrocarbon, metallic and mineral deposits is outlined. Fundamentals on exploration seismology, exploration electromagnetics, petrophysics and related fields are covered. The future direction of exploration methodologies is discussed, too.
Rock physics and mechanics,3times,Rock mechanics necessary to the development of ore deposit, the storage of carbon dioxide (CCS), radioactive waste, underground oil stockpiling is outlined in the lecture. Foundamental knowledge on the stress and the strain of elastic materials, geopressure to subsurface artificial structure, deformation due to geopressure, and the failure of rocks and subsurface structures will be shared in the lectures.
Reservoir engineering,3times,The importance to understand subsurface porous flow through permeable rocks is discussed in terms of the following applications: the production of fluid resources, carbon dioxide capture and storage (CCS), storage of radioactive waste, underground stockpile of oil, etc. The understanding on important parameters of fluid saturation, permeability, etc. that are related to subsurface porous flow will be matured for the application of reservoir management, coal bed methane and CCS to utilize permeable nature of rocks.

Continue to 資源工学入門(2)↓↓↓

地質工学(2)

understanding of how to model and visualize geological and environmental data that varies according to time and space.

Integrated analytics of mechanical data (4 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.

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]

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

*Please visit KULASIS to find out about office hours.

資源工学入門(2)

[Course requirements]

Preferred students are whom has taken quotResources and Energyquot in the first semester of the sophomore grade.

[Evaluation methods and policy]

Grading is based on the following shares: 20% for the attendance, reports, etc., and 80% for the final exam.

[Textbooks]

None specified.

[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

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

Course number	U-ENG25 35173 LJ75		
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 Associate Professor,MURATA SUMIHIKO
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Fri.2	Class style	Lecture
Language of instruction	Japanese		

[Overview and purpose of the course]

Fluid flow in an oil and gas reservoir and geothermal reservoir is explained. Then, the reservoir properties relating to the flow such as porosity, permeability, relative permeability, capirally pressure and so on are explained. Reservoir fluids properties and their phase behavior are also explained. Furthermore, drilling and completion for a oil/gas well, log interpretation method and well test analysis are explained.

[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 interpretaion method and well test analysis.

[Course schedule and contents]

1st: Introduction (Explanation about class schedule and grade evaluation), Summary of oil filed development, Reserves and reserve evaluation methods
2nd: Reservoir rock properties 1 (Porosity and Compressibility)
3rd: Reservoir rock properties 2 (Wettability and Capillary pressure)
4th: Reservoir rock properties 3 (Darcy's law, permeability and effective permeability)
5th: Reservoir rock properties 4 (Relative permeability)
6th: Exercise for the reservoir rock properties
7th: Reservoir fluid properties
8th: Drive mechanism and material balance equations
9th: Oil well drilling and completion
10th: Electrical properties of reservoir rock
11th: Well logging
12th: Basic equation of fluid flow in reservoir
13th: Basic theory of well test analysis
14th: Exercise of well test analysis
15th: Semester examination
16th: Feedback (Review of this class and examination)

Continue to 貯留層工学(2)↓↓↓

Course number	U-ENG29 39141 SJ11		
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,KAWASAKI MASASHI 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,OONISHI MASAMITSU Disaster Prevention Research Institute Associate Professor,YOKOMATSU MUNETA
Target year	4th year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.2	Class style	Lecture
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. 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

[Course requirements]

None

Continue to 社会防災工学(2)↓↓↓

貯留層工学(2)

[Course requirements]

The knowledge of differential calculus, integral calculus, physical chemistry and exploration geophysics are 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 solve the homework problems with reviewing 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

社会防災工学(2)

[Evaluation methods and policy]

Evaluation is based on attendance (60%) and report assignments etc. (40%).

[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

Course number	U-ENG25 35174 LJ53　U-ENG25 35174 LJ72		
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 Professor,KOIKE KATSUAKI Graduate School of Engineering Professor,MIKADA HITOSHI Graduate School of Engineering Assistant Professor,XU　Shibo Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/First semester
Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

地球表層から地下を診る技術である各種の物理探査法について、その探査原理、データ取得技術、データ処理技術および解釈方法について基礎的な物理化学的な原理を講述するとともに、エネルギー・資源分野、環境分野，防災分野，地盤工学分野、土木工学分野への適用についても紹介する。

[Course objectives]

物理探査手法について，電磁気学，地震学，地球化学，岩石物理学の観点から理解することを目標とする。

[Course schedule and contents]

地球電磁気学と物理探査,5回,地球電磁気学的手法による探査技術の基礎理論を概説する。物理探査の分野で用いられる地球電磁気学的手法について、その物理学的な基礎、計測される物理量を学ぶことにより、その物理学的な意義について理解することを目標とする。
地震学と物理探査,6回,地震学的手法による探査技術の基礎理論を概説する。地震学の基礎から屈折法や反射法探査について、その物理学的な基礎から，計測物理量について学ぶことにより、その応用科学的な意義について理解することを目標とする。
地化学探査とリモートセンシング,3回,地殻，マントル，コアを形成する岩石鉱物の化学的性質，および金属鉱床やエネルギー資源の探査に用いられる地球化学的計測法の基礎について地化学的概説の後，リモートセンシング技術に用いられる電磁波と物質の相互作用，光学センサ，合成開口レーダなどの基礎，リモートセンシング画像処理法および地形解析，資源探査，環境モニタリングなどへの応用について説明する。
達成度の確認,1回,講義内容の理解度に関し，確認を行なう。演習やテストの解答を行い，理解不十分箇所の確認を通じ，到達度を上げる。

[Course requirements]

大学教養レベルの物理学，化学，地球科学

[Evaluation methods and policy]

基本的に筆記試験で行うが，成績評価の方法について、各担当者が説明することがある。

Continue to 物理探査学(2)↓↓↓

Course number			
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 Engineering Associate Professor,ECHIGO SHINYA Graduate School of Engineering Assistant Professor,GOMI RYOUTA Graduate School of Energy Science Assistant Professor,YAMAMOTO KOUHEI Agency for Health, Safety and Environment Assistant Professor,YANO JUNYA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Fri.4,5	Class style	Seminar	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（担当教員A）イントロ・講義
第2回（担当教員A）データ解析演習　Rの基本
第3回（担当教員A）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（担当教員A）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（担当教員B）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（担当教員B）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（担当教員B）データ解析演習　画像処理
第8回（担当教員B）データ解析演習　因子分析・モンテカルロ法

第9回（担当教員C）　環境工学データ解析課題１についての講義
第10回（担当教員C）　環境工学データ解析課題１についての演習
第11回（担当教員C）　環境工学データ解析課題１についての発表・討論
第12回（担当教員D）　環境工学データ解析課題２についての講義
第13回（担当教員D）　環境工学データ解析課題２についての演習
第14回（担当教員D）　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

Continue to 環境工学解析演習(2)↓↓↓

物理探査学(2)

[Textbooks]

Not used

[References, etc.]

（**Reference books**）
佐々宏一・芦田譲・菅野強 『建設・防災技術者のための物理探査』（森北出版）ISBN:4627484402
日本リモートセンシング学会 『基礎からわかるリモートセンシング』（理工図書）ISBN:4844607790

（**Related URLs**）
(講義中に伝達する。)

[Study outside of class (preparation and review)]

必要な事項は，講義中に伝達する。

（**Other information (office hours, etc.)**）

出席・試験の配点の詳細は各担当者より説明する。 定期試験後，模範解答を配布しフィードバックとする予定。

*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
シュルンベルジェ株式会社 10年
海洋研究開発機構　5.5年
地盤環境研究所　2.3年

(3) Details of practical classes delivered based on instructors’ practical work experience
民間の実務で用いられる物理探査についての基礎理論の講義実施

環境工学解析演習(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]

【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％）
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]

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， 桂Ｃ-1, 231室を訪れること。

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 13503 SE73		
Course title (and course title in English)	Introduction to Global Engineering Introduction to Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Senior Lecturer,Chang, Kai-Chun
Target year	1st year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Wed.4	Class style	Lecture
Language of instruction	English		

[Overview and purpose of the course]

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

[Course objectives]

To understand concepts of global engineering. To understand subjects and contents that students should study at the department of global engineering within 4 years.

[Course schedule and contents]

Guidance,1time,Introduction to the course.
Safety amp Engineering ethics,1time,Introduction to safety on their study and research, and engineers#039 obligations to the public, clients, employers, and the profession.
Lecture,6times,Major roles in solving problems on a global scale from civil, environmental, and resources engineering point of views.
Small group seminar,6times,Each small group of participants visits a laboratory associated with global engineering and take a seminar. Students have to choose a theme relating to global engineering as a group project and perform the project under the supervision of a faculty member.
Introduction of latest research,2times,Visit laboratories of the global engineering department to widen students#039 knowledge and to deepen their understanding of the role and importance of the global engineering.

[Course requirements]

No prerequisite is required.

[Evaluation methods and policy]

Coursework will be graded based on reports and attendance.

[Textbooks]

A textbook is not required. Materials will be delivered by instructors as needed.

[References, etc.]

（**Reference books**）

Continue to Introduction to Global Engineering(2)↓↓↓

未更新

Course number	U-ENG25 35152 LJ71 U-ENG25 35152 LJ77		
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 Senior Lecturer,Chang, Kai-Chun
Target year	1st year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.1,Thu.1	Class style	Seminar
Language of instruction	English		

[Overview and purpose of the course]

The purpose of this course is to understand how Civil Engineering relates to our society. In order to do this, this course firstly explains the target area and new topics related to Civil Engineering with some concrete examples. Then, students examine one of the social infrastructure in their countries and make a presentation. After introducing brainstorm and KJ method, which is a methods for structuring problems, students discuss desirable social infrastructure with group members and make a presentation about the results.

[Course objectives]

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

[Course schedule and contents]

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

[Course requirements]

None

Continue to Exercises in Infrastructure Design(2)↓↓↓

Introduction to Global Engineering(2)

[Study outside of class (preparation and review)]

（**Other information (office hours, etc.)**）

*Please visit KULASIS to find out about office hours.

Exercises in Infrastructure Design(2)

[Evaluation methods and policy]

Grade is scored 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)]

（**Other information (office hours, etc.)**）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG25 35153 LJ71		
Course title (and course title in English)	Computer Programming in Global Eng Computer Programming in Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong

Target year	1st year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Thu.5	Class style	Seminar	Language of instruction	English

[Overview and purpose of the course]

This course aims to introduce the basic computational tools needed in Global Engineering fields, and to learn and practice a computer programming language Fortran 90. Not only the fundamentals of the Fortran language, but this course also focus on numerical algorithms that are actually encountered in researches and applications such as root finding, numerical differentiation and integration methods, sorting techniques and matrix inversion.

[Course objectives]

To understand basic IT processing capabilities in Global Engineering areas and to acquire basic logic and syntax of Fortran 90 programming knowledge.

[Course schedule and contents]

Overview,1time,Overview on using computer terminals and description of programming language Fortran 90
Basic program and data types,1time,Main parts of a basic program and data types (integer, real, character)
Branches and loops,2times,Conditional branching to change the flow of a program and create repetition is explained
Array concepts,2times,The array concept is explained for practical calculations such as sorting algorithms
Formats and basic I/O concepts,2times,The basics of reading and writing of files to disk is presented. Methods and formats will be explained via an example
Subprograms,2times,Explanation of the use of subroutines and function subprograms to work in large-scale programs.
Numerical analyses,2times,Declaration and operation methods, I/O, multiplication, referencing are explained via a programming exercise
Exercise,2times,QampA practice of the topics studied so far.
Class feedback,1time,Confirmation of understanding

[Course requirements]

None

[Evaluation methods and policy]

Grading will be based on reports (30%), a mid-term exam (30%), and a final exam (40%).

Continue to Computer Programming in Global Eng(2)↓↓↓

未更新

Course number	U-ENG23 23506 LE73		
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	2020/First semester
Days and periods	Mon.4	Class style	Lecture	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,2times,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,3times,Newton#039s 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,1time,the Law of Gravitation\ center of mass and center of gravity\ motion through a resisting medium\ constrained motion
energy conservation,2times,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,2times,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,1time,transformation formulae\particle dynamics in a non-frame\motion relative to the Earth\multi-particle system in a non-inertial frame
motion of rigid body,2times,dynamical problem of the motion of a rigid body\ rotation about an axis\ statics of rigid bodies\ statics of structures\ equilibrium of flexible strings and cables\equilibrium of solid beams\ angular momentum of a rigid body\inerital and stress tensors
foundation of analytical mechanics,1time,Constraint condition,constraint force, generalized coordinate, generalized for, Lagrange#039s equations
confirmation of achievement,1time,The achievement assessment is intended to measure students#039 knowlege, skill and aptitude on the subject using quiz and viva-voce.

Continue to Fundamental Mechanics(2)↓↓↓

Computer Programming in Global Eng(2)

[Textbooks]

Exercise book will be provided. Class materials are provided thru KULASIS.

[References, etc.]

（**Reference books**）
Stephen Chapman: quotFortran for Scientists and Engineers: 1995-2003quot isbn{}{9780071285780}
Brian Hahn: quotFortran 90 for Scientists and Engineersquot isbn{}{9780340600344}

[Study outside of class (preparation and review)]

Assignments are delivered and submitted thru PANDA

（Other information (office hours, etc.)）

Assoc.Prof. Thirapong PIPATPONGSA
Office: Department of Urban Management, C1-2-236
E-mail: pipatpongsa.thirapong.4s@kyoto-u.ac.jp)

*Please visit KULASIS to find out about office hours.

Fundamental Mechanics(2)

[Course requirements]

calculus A and B, Linear Algebra A and B

[Evaluation methods and policy]

Grade is evaluated based on the final examination and assignments.

[Textbooks]

R.DOUGLAS GREGORY: Classical Mechanics, Cambridge University Press, 2006 isbn{}{9780521534093}

[References, etc.]

（**Reference books**）
Keith R.Symon: Mechanics, Third Edition, Addision-Wesley, 1971 isbn{}{0201073927}
Fedinand P.Beer, E.Russell Johnston, etc.: Mechanics for Engineers, Dynamics, McGraw Hill, 2007 isbn{}{9780072464771}

[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 23507 LE73		
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	2020/First semester		
Days and periods	Tue.3,4	Class style	Seminar
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]

Introduction,1time,Role of probabilistic and statistical approaches in global engineering and in other engineering fields.
Basic theory of probabilistic analysis,4times,The concepts and basic theories of probability: Conditional probability, Bayesrsquo theorem and total probability. Random variables: probability mass function (PMF), probability density function (PDF), cumulative distribution function (CDF), moment generating function, characteristic function, multidimensional probability distribution, transform of random variables.
Probability distribution models,4times,Probability distributions often used in global engineering are introduced: Bernoulli series and binomial distribution, Poisson series and distribution, normal distribution, geometric distribution (return period), etc.
Statistical estimation and testing,3times,Basic theory on sampling. Chi-square distribution, t- distribution, and F-distribution. Methods for statistical estimation and testing.
Multivariate analysis,2times,Basic methods in multivariate analysis: regression analysis and principal component analysis.
Computer-based simulation methods in probability,1time,Introduction to the computer-based simulation methods such as Monte-Carlo simulation, will be given.

[Course requirements]

Prerequisite courses are calculus and linear algebra.

Continue to Prob. & Statistical Analysis & Exercises(2)↓↓↓

未更新

Course number	U-ENG23 23508 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 Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Management Professor,TODA KEIICHI Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Thu.3	Class style	Lecture
Language of instruction	English		

[Overview and purpose of the course]

Civil Engineering is the field that provides the essential technology and knowledge to improve the social infrastructure. Various science, technology, and knowledge are required 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, 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 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 from the viewpoint of Structural Engineering, which includes natural disasters and structural engineering, introduction of new technology and research, the collaboration with other fields, etc.
Hydraulics and Hydrology,3times,Civil Engineering is introduced from the viewpoint of Hydraulics and Hydrology, which includes conservation and construction of river environment, prediction of rainfall and flood, prediction of environmental change, global warming etc.
Geotechnical Engineering,3times,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,3times,Civil Engineering is introduced from the viewpoint 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 assessment is intended to measure students#039 knowledge, skill and aptitude on the subject.

Continue to Design for Infrastructure I(2)↓↓↓

Prob. & Statistical Analysis & Exercises(2)

[Evaluation methods and policy]

Evaluation is based on written tests (midterm exam: 40%, final exam: 40%), assignment (10%), and attendance (10%).

[Textbooks]

Not specified. Some handout materials 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. isbn{}{9780471720645}

[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 preffered through [kim.sunmin.6x@kyoto-u.ac.jp].

*Please visit KULASIS to find out about office hours.

Design for Infrastructure I(2)

[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)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23509 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	2020/Second semester		
Days and periods	Mon.1,2	Class style	Seminar
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 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]

Basic Theory of Civil Engineering Planning (CEP),3times, These lectures provide a basic overview of CEP and teach about the science underpinning CEP. Therefore lectures introduce the students to the role of OR, economics, psychology, sociology and political science in CEP.
Linear programming (LP),10times, Lectures about LP as basic method for mathmatecial planning. Various issues of LP are discussed and in particular the Gauss Jordan Elimination Method and the Simplex methods are taught. Further the dual problem, marginal value and sensitivity analysis are introduced.
Non linear programming (NLP),10times,NLP formulation of problems, global optimality, and description as programming problem. Optimality conditions of nonlinear programming problems (Lagrange function, Kuhn Tucker conditions) are examined.
Dynamic programming (DP),7times,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.

[Course requirements]

Students are assumed to have taken the calculus courses.

Continue to Systems Analysis & Exe. for Plan. & Mng.(2)↓↓↓

未更新

Course number	U-ENG23 23510 LE55		
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	Graduate School of Global Environmental Studies Professor,KATSUMI TAKESHI Graduate School of Engineering Professor,KIMURA MAKOTO Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Tue.3,4	Class style	Seminar
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#039s law, flow nets, consolidation theory, Mohr#039s 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 Atterbergrsquos 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)↓↓↓

Systems Analysis & Exe. for Plan. & Mng.(2)

[Evaluation methods and policy]

Assignments, Midterm Exam 40%; Final Exam 60%

[Textbooks]

Handouts distributed during 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)]

（**Other information (office hours, etc.)**）

*Please visit KULASIS to find out about office hours.

Soil Mechanics I and Exercises(2)

[Course requirements]

None

[Evaluation methods and policy]

Final Exam (70%), Midterm exam and classworks (30%)

[Textbooks]

Soil Mechanics I amp II Tutorial Exercises and Soil Mechanics Laboratory Manual
Handouts will be distributed

[References, etc.]

（**Reference books**）

J.A. Knappett and R.F. Craig, ldquoCraigrsquos Soil Mechanicsrdquo isbn{}{9780415561266}
T. William Lambe and R.V. Whitman, ldquoSoil Mechanicsrdquo isbn{}{0471022616}
Braja M. Das,quotFundamentals of Geotechnical Engineeringquot isbn{}{9781111576752}
K. Terzaghi, R. B. Peck, G. Mesri,ldquoSoil Mechanics in Engineering Practicerdquo isbn{}{9780471086581}
Fusao Oka, quotSoil Mechanics Exercisesquot, Morikita publishing Co., Ltd. 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.)**）

G. Flores (flores.giancarlo.3v@kyoto-u.ac.jp)
T. Pipatpongsa (pipatpongsa.thirapong.4s@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

Course number	U-ENG23 23511 LE73		
Course title (and course title in English)	Hydraulics and Exercises Hydraulics and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Management Professor,TODA KEIICHI Graduate School of Engineering Professor,HOSODA TAKASHI Graduate School of Engineering Associate Professor,KHAYYER, Abbas Graduate School of Engineering Assistant Professor,IKARI HIROYUKI Graduate School of Engineering Assistant Professor,OKAMOTO TAKAAKI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Wed.3,4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

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

[Course objectives]

Systematic understanding of fundamental hydraulics through exercises

[Course schedule and contents]

<Lecture(Lec) 90minutes:1 time, Exercises(Ex) 90minutes:0.5 times>

●Fluid Statics, Buoyancy, Flotation Stability [Lec:1time, Ex:1time]:
Hydrostatic pressure, buoyancy force, stability of floating body are explained and their exercises are implemented.

●Elementary Fluid Dynamics [Lec:2times, Ex:1.5 times]:
Continuum dynamics, control volume method, continuum equation, momentum equation and one-deimensional analysis are explained and their exercises are implemented.

●Potential Flows [Lec:1time, Ex:0.5 times]:
Bernoulli's theorem and two-dimensiional irrotational flow is explained and their exercises are implemented.

●Viscous Flow and Turbulence [Lec:2times]:
Deformation stress, Navier Stokes equation, shear stress for laminar flow and frictional loss, laminar and turbulent flow and velocity distribution of turbulent flow are explained.

●Comprehensive Exercise [Ex:1time]:
Comprehension check regarding to each term is implemented.

●Intermediate examination:

Continue to Hydraulics and Exercises(2)↓↓↓

Hydraulics and Exercises(3)

*Please visit KULASIS to find out about office hours.

Hydraulics and Exercises(2)

Intermediate examination is carried out.

●Dimensional Analysis, Similitude [Ex:0.5 times]:
Dimensional analysis, pi-theorem and similarity rule are explained and their exercises are implemented.

●Viscous Flow in Pipes [Lec:2times, Ex:1time]:
Energy equation, frictional law, form drag loss, siphon and pipe flow are explained and their exercises are implemented.

●Open-Channel Flow [Lec:3times, Ex:2times]:
Energy equation, momentum equation, open channel equation, specific energy, specific force, hydraulic jump and analysis of gradually varied flow are explained and their exercises are implemented.

●Achievement confirmation:
Comprehension check of course contents.

●Feedback

[Course requirements]

Differential and integral calculus, linear algebra etc., standard mathematics of general education course, and Dynamics and electromagnetism etc., standard physics of general education course

[Evaluation methods and policy]

Based on the results of examinations

[Textbooks]

Handout is used in the Lectures and Exercises.

[References, etc.]

（**Reference books**）
Non

（**Related URLs**）
(Non)

[Study outside of class (preparation and review)]

Review the lecture contents.
Prepare the exercises questions and review them.

（Other information (office hours, etc.)）

Lecture is opened along with exercise. How to contact with instructors is announced during lecture and exercise.

Continue to Hydraulics and Exercises(3)↓↓↓

未更新

Course number	U-ENG25 25162 LJ71 U-ENG25 25162 LJ57 U-ENG25 25162 LJ77		
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	2020/Second semester
Days and periods	Thu.2	Class style	Lecture	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#039 expansion. To calculate the residue and to learn the engineering applications of complex function theory.

[Course schedule and contents]

Review,3times,Definition of complex numbers, complex plane and review of vector analysis.
Basic theory of complex functions,3times,Derivative of complex functions, Cauchy-Riemann equation. Concept and properties of holomorphic functions. Cauchy#039s integral theorem, Cauchy#039s integral formula, Taylor series and Laurent series. Classification of singularities. Residue theorem. Various complex functions and their properties.
Application of theory of complex functions,2times,Application of residue theorem to calculate the definite integral. Deviation principle and its application. Solution of boundary value problems of partial differential equations.
,9times,
,2times,
,1time,

[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.

[Textbooks]

[References, etc.]

（**Reference books**）
Materials given during the lecture.

[Study outside of class (preparation and review)]

（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.

未更新

Course number	U-ENG25 25163 LJ75		
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 Senior Lecturer,Chang, Kai-Chun
Target year	2nd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.1,2	Class style	Seminar
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/deformation; cross sectional properties; calculation of displacement; buckling of column. Statically determinate structures are to be focused on.

[Course objectives]

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

[Course schedule and contents]

- Introduction: 1 time,
- Structures and elements; Purpose and application scope of structural mechanics Assumptions; Forces & Equilibrium condition: 2 times,
- External forces; Modeling of external forces; Force equilibrium conditions; Static determinate, static indeterminate and instability; Internal force diagrams: 9 times,
- Equilibrium of free body; Sectional forces; Axial force; Flexural moment and shear force: 4 times,
- Influence line; Construction of Influence line; use of Influence line: 2 times,
- Sectional properties; Centroid; Geometrical moment of area; Moment of inertia of area: 4 times,
- Hooke’s Law; Stress and strain; stress state and stress transformation; Mohr’s Circle: 4 times,
- Elastic curve and deflection; Deflection of beam; Deflection of truss: 2 times,
- Buckling of column; Buckling phenomenon; Euler’s buckling load: 1 time,
- Confirmation of achievement: 1 time

[Course requirements]

Classical mechanics

[Evaluation methods and policy]

Grade is given based on the final examination, mid-term examination, quiz, assignments and participation.

[Textbooks]

Lecture note will be provided.

[References, etc.]

（**Reference books**）

References

Continue to Structural Mechanics I and Exercises(2)↓↓↓

Course number	U-ENG23 33514 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 Graduate School of Engineering Professor,KIYONO JIYUNJI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Mon.2	Class style	Lecture
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]

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-dreedom 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 normal vibration modes.

Continue to Dynamics of Soil and Structures(2)↓↓↓

Structural Mechanics I and Exercises(2)

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. 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.)**）

*Please visit KULASIS to find out about office hours.

Dynamics of Soil and Structures(2)

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)
Evaluation of students' achievements in understanding of the course material

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

[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)]

To be notified by instructor during his/her lecture.

Continue to Dynamics of Soil and Structures(3)↓↓↓

Dynamics of Soil and Structures(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.

Construction Materials(2)

[Course requirements]

None

[Evaluation methods and policy]

Reports and Final examination.

[Textbooks]

P.Kumar Mehta, Paulo J.M.Monteiro:Concrete microstructure, properties and materials, McGraw-Hill,2006 isbn{}{9780071797870}
William D. Callister, Jr. David G. Rethwisch:Materials science and engineering an Introduction, John Wiley amp Sons, Inc.,2014 isbn{}{9781118477700}

[References, etc.]

（**Reference books**）
宮川豊章、六郷恵哲共編：『土木材料学』、朝倉書店 isbn{}{9784254261622}

[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 33515 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	2020/First semester		
Days and periods	Mon.1	Class style	Lecture
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,1time,Classification of materials, history of construction materials, ethics for civil engineers and current topics
crystal structure,1time,Bond between atoms, ideal strength, dislocation, yield, and mechanical properties are introduced
Metallic material,1time,Mechanical properties of metals, steel, phase diagrams, Dislocations and metallic new materials
Corrosion amp protection,1time,durability, corrosion, deterioration mechanism, carbonation, chloride induced corrosion and corrosion protection
Cement,1time,Types of cements, chemical composition, chemical compound, hydration, hydration heat and blended cement
admixtures,1time,Chemical admixture, water-reducing admixture, air-entraining admixture, mineral admixture, pozzolanic reaction, latent hydraulic property and high-range admixture are introduced.
aggregate,1time,Moisture condition, Chloride ion, Total chloride ion content, alkali-silica reaction and total alkali content
fresh concrete,1time,Workability, rheology, consistency, segregation and mix design
hardened concrete,1time,water cement ratio, compressive strength, flexural strength, tensile strength, durability and testing methods
mechanical properties of concrete,1time,Interfacial transition zone in concrete,strength-porosity relationship, Behavior of concrete under various stress states,Dimensional Stability,
Non-destructive testing method,1time,Surface hardness, ultrasonic pulse, thermography, half cell potential and polarization resistance
Special concrete,1time,Fiber reinforced concrete, flowing concrete, MDF cement and mineral new materials
Polymer material,1time,Resin, rubber, fiber, polymer concrete and organic new materials
review,1time,review mainly on concrete and steel
achievement assesment,1time,The achievement assessment is intended to measure students#039 knowledge, skill and aptitude on the subject using quiz.

Continue to Construction Materials(2)↓↓↓

Course number	U-ENG23 33516 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 Associate Professor,KITANE YASUO
Target year	3rd year students or above	Number of credits	3
Year/semesters	2020/First semester		
Days and periods	Mon.4,5	Class style	Seminar
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
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: Feadback

[Course requirements]

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

Continue to Structural Mechanics II and Exercises(2)↓↓↓

Structural Mechanics II and Exercises(2)

[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 mechanics Ⅱ, 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.

Continuum Mechanics(2)

[Course requirements]

Basic understanding on differential and integral calculus, linear algebra and matrix analysis

[Evaluation methods and policy]

Mainly regular examination. Assignments are also considered to some extent.

[Textbooks]

Printed materials on the contents of this subject are distributed

[References, etc.]

（**Reference books**）
P. Chadwick, quotContinuum Mechanics: Concise Theory and Problemsquot, Dover Publications isbn{}{0486401804}
A.J.M. Spencer, quotContinuum Mchanicsquot, Dover Publications isbn{}{0486435946}
G.E. Mase, quotSchaum#039s Outline of Continuum Mechanicsquot, McGraw-Hill isbn{}{0070406634}

[Study outside of class (preparation and review)]

Elementary knowledge of vector analysis is required.

（**Other information (office hours, etc.)**）

Students can contact with
Prof. Hosoda by e-mail: hosoda.takashi.4w@kyoto-u.ac.jp or office at Katsura C1-265
Assoc. Prof. Higo by e-mail: higo.yohsuke.5z@kyoto-u.ac.jp or office at Katsura C1-211
Assoc. Prof. Thirapong by e-mail: pipatpongsa.thirapong.4s@kyoto-u.ac.jp or office at Katsura C1-236

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33517 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 Professor,HOSODA TAKASHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,HIGO YOUSUKE Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.5	Class style	Lecture
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,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
Principle of energy, variational method and initial-boundary-value problems,2times,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,4times,Applications in Elasticity and Fluid Dynamics. Stress distribution and Wave propagation in elastic body, Thermal convection and Lorentz Chaos, etc.
Class feedback,1time,Achievement confirmation

Continue to Continuum Mechanics(2)↓↓↓

未更新

Course number	U-ENG23 33519 LE73		
Course title (and course title in English)	Hydraulics and Hydrodynamics Hydraulics and Hydrodynamics	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,TODA KEIICHI Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.2	Class style	Lecture
Language of instruction	English		

[Overview and purpose of the course]

Lecture of fundamental theories of fluid dynamics and applications to hydraulic engineerging Basic equations, potential flow theory, boundary layer theory and turbulent flow Introduction of basic modelings about fluid motion and heat transfer in atmosphere related to hydrology and meteorology

[Course objectives]

Learning elementary knowledge of hydraulics and important topics of hydrodynamics science

[Course schedule and contents]

Open channel flow (1),1time,Basic equations of non-uniform flow, longitudinal profile
Open channel flow (2),1time,Non-uniform flow computation
Unsteady pipe flow,1time,Basic equations of unsteady pipe flow, application to water hummer phenomenon and surge tank
Unsteady open-channel flow,1time,Basic equations of unsteady open-channel flow, theories of flood flow and hydraulic bore
Introduction of fluid dynamics (1),1time,Boundary theory and application to hydraulic engineering
Introduction of fluid dynamics (2),1time,Primer of turbulence theory and application to hydraulic engineering
pplied hydraulics (1) ,1time,Seepage flow and its analysis
Applied hydraulics (2) ,1time,Fundamentals of sediment transport
Applied hydraulics (3) ,1time,Sediment related topics of rivers
Hydrometeorology (1),1time,Introduction to hydrometeorology
Hydrometeorology (2),1time,Thermodynamics of atmosphere, Dry-adiabatic process
Hydrometeorology (3),1time,Vertical stability of atmosphere for infinitesimal displacement
Hydrometeorology (4) ,1time,Moisture in atmosphere, Moist-adiabatic process
Hydrometeorology (5) ,1time,Latent instability, Land surface process of atmosphere
Achievement confirmation,1time,Achievement of learning is confirmed.

[Course requirements]

None

Continue to Hydraulics and Hydrodynamics(2)↓↓↓

Hydraulics and Hydrodynamics(2)

[Evaluation methods and policy]

Attendance, reports and final examination

[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.

Fundamentals of Hydrology(2)

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**）

[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 33520 EE73		
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 Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.3	Class style	Lecture
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.
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

Continue to Fundamentals of Hydrology(2)↓↓↓

未更新

Course number	U-ENG23 33521 LE73 U-ENG23 33521 LE55 U-ENG23 33521 LE24		
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,OOTSU HIROYASU Graduate School of Engineering Professor,KIMURA MAKOTO Graduate School of Engineering Professor,MIMURA MAMORU Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Engineering Associate Professor,HIGO YOUSUKE Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong
Target year	3rd year students or above	Number of credits	3
Year/semesters	2020/First semester		
Days and periods	Wed.1,2	Class style	Seminar
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, 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 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.

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,

Continue to Soil Mechanics II and Exercises(2)↓↓↓

未更新

Soil Mechanics II and Exercises(2)

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

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(35080) would be helpful as a prerequisite.

[Evaluation methods and policy]

Final Exam (70%), Midterm exams and classworks (30%)

[Textbooks]

Soil Mechanics I amp II Tutorial Exercises and Soil Mechanics Laboratory Manual
Exercise book and distributed handouts

[References, etc.]

（**Reference books**）
Braja M. Das,ldquoFundamentals of Geotechnical Engineeringrdquo, Cengage Learning isbn{}{9781111576752}
Muni Budhu,ldquoSoil Mechanics and Foundationsrdquo, John Wiley amp Sons, INC. isbn{}{9780470556849}
Isao Ishibashi, Hemanta Hazarika,ldquoSoil Mechanics Fundamentalsrdquo, CRC Press isbn{}{9781439846445}
Fusao Oka,ldquoSoil Mechanics Exercisesrdquo, Morikita publishing Co., Ltd. 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

Continue to Soil Mechanics II and Exercises(3)↓↓↓

Course number	U-ENG23 33522 LE55 U-ENG23 33522 LE73		
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 Graduate School of Engineering Professor,MIMURA MAMORU Graduate School of Management Associate Professor,KIMOTO SAYURI Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Engineering Associate Professor,HIGO YOUSUKE Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,KITAOKA TAKAFUMI Graduate School of Engineering Assistant Professor,KIDO RYUNOSUKE Graduate School of Engineering Assistant Professor,SAWADA MAI Disaster Prevention Research Institute Assistant Professor,UEDA KYOHEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Wed.3,4	Class style	Seminar
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)↓↓↓

Soil Mechanics II and Exercises(3)

（**Other information (office hours, etc.)**）

Flores (flores.giancarlo.3v@kyoto-u.ac.jp)
Pipatpongsa (pipatpongsa.thirapong.4s@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

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

Centrifuge model test, 0.5 times, 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. It is recommended to take soil mechanics II and exercises 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 amp II Tutorial Exercises and Soil Mechanics Laboratory Manual
Handouts will be distributed

[References, etc.]

（**Reference books**）
『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 (Vol.2)』（Japanese Geotechnical Society）ISBN:4886448224
『JAPANESE GEOTECHNICAL SOCIETY STANDARDS Laboratory Testing Standards of Geomaterials (Vol.3)』（Japanese Geotechnical Society）ISBN:4886448240
Braja M. Das, ldquoSoil Mechanics Laboratory Manualrdquo, Oxford University Press isbn{}{9780190209667}
Dante Fratta et al., ldquoIntroduction to Soil Mechanics Laboratory Testingrdquo, CRC Press isbn{}{9781420045628}
土質試験:基本と手引き，地盤工学会 isbn{}{9784886440846}
土質試験の方法と解説，地盤工学会 isbn{}{4886440584}

Continue to Exp on Soil M & Ex(3)↓↓↓

Exp on Soil M & Ex(3)

[Study outside of class (preparation and review)]

It is recommended to read testing procedure beforehand.

（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. The following two professors are also available.
Flores (flores.giancarlo.3v@kyoto-u.ac.jp)
Pipatpongsa (pipatpongsa.thirapong.4s@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

Plan & Mng of S Sys(2)

[Textbooks]

None

[References, etc.]

（Reference books）
Hillier, F.S. and Lieberman, G.J. (2015) Introduction to Operations Research. 10th Edition. McGraw Hill. isbn{}{9781259253188}
Straffin, P.D. (1993). Game Theory and Strategy. The Mathematical Association of America. New Mathematical Library. isbn{}{0883856379}
Further useful textbooks and materials are introduded during the lectures.

[Study outside of class (preparation and review)]

（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.

未更新

Course number	U-ENG23 33523 EE73		
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	2020/First semester		
Days and periods	Thu.2	Class style	Lecture
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 mathematical and psychological typical models for system analysis.

[Course schedule and contents]

Introduction,1time,Problems of infrastructure planning and management, and its methodology. Abstract of systems analysis and quotphysics of societyquot.
Markov models,2times,Markov process. Transition probability matrix. Steady state.
Time-series predicting model,2times,Serial correlation. Auto-Regressive model. AutoRegressive-Moving Average model.
Queuing theory,2times,single and multiple queues, examples of various M/D/k queues
Game theory and general social dilemma situations,3times,Strategic interdependency. Nash equilibrium. Typical models. Social dilemma situations and infrastructure planning.
Social psychology and planning,2times,Attitudes, values and their influence on behavior and planning
Hazard Analysis,2times,Examples of major accident analysis; fault trees and event trees.
Comprehension Test,1time,final exam

[Course requirements]

None

[Evaluation methods and policy]

Joined judgement of report and end of term exam.

Continue to Plan & Mng of S Sys(2)↓↓↓

未更新

Course number	U-ENG23 33524 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	2020/First semester		
Days and periods	Fri.1	Class style	Lecture
Language of instruction	English		

[Overview and purpose of the course]

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

Introduction,1time,What is Fourier Analysis? How to apply it? Clarify the necessary background knowledge.
Fourier series,4times,A periodic function which is expanded into an infinite series of trigonometric functions is called a Fourier series. Convergence behaviour and series properties are discussed with specific example calculations.
Fourier transform,5times,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.
Application to Partial Differential Equations,4times,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.
Numerical Fourier analysis,1time,Fast Fourier transform (FFT) is a basic Fourier transform algorithm. In this lecture it is explained and a software illustration provided.

[Course requirements]

Calculus, Linear Algebra, Engineering Mathematics B1.

[Evaluation methods and policy]

Participation, assignment and 2 tests (mid and end)

Continue to Engineering Mathematics B2(2)↓↓↓

Engineering Mathematics B2(2)

[Textbooks]

None.

[References, etc.]

（**Reference books**）

Pinkus, A. and Zafrany,S.: Fourier Series and Integral Transforms, Cambridge University Press. isbn{}{ 0521597714}

Further material is introduced during classes.

（**Related URLs**）

(None)

[Study outside of class (preparation and review)]

（**Other information (office hours, etc.)**）

*Please visit KULASIS to find out about office hours.

Experiments on Hydraulics(2)

[Overview and purpose of the course]

Guidance of laboratory experiments in hydraulics and measurement instruments. Eight experiments are conducted about pipe flow, open-channel flow, waves, flow in porous media, density flow, hydrodynamic force, sediment transport

[Course objectives]

Understanding hydraylic phenomena through various flows observed in the hydraulic laboratory

[Course schedule and contents]

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

[Course requirements]

Hydraulics and Exercises

[Evaluation methods and policy]

Attendance : 40 points Reports and homework : 60 points total : 100 points

[Textbooks]

Continue to Experiments on Hydraulics(3)↓↓↓

未更新

Course number	U-ENG23 33526 LE73
Course title (and course title in English)	Experiments on Hydraulics Experiments on Hydraulics
Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Management Professor,TODA KEIICHI Graduate School of Engineering Professor,HOSODA TAKASHI Disaster Prevention Research Institute Professor,MORI NOBUHITO Graduate School of Engineering Associate Professor,ICHIKAWA YUTAKA Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,KHAYYER, Abbas Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI Disaster Prevention Research Institute Associate Professor,KAWAIKE KENJI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,TAKEBAYASHI HIROSHI Disaster Prevention Research Institute Associate Professor,TANAKA KENJI Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Disaster Prevention Research Institute Associate Professor,YONEYAMA NOZOMU Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Assistant Professor,IKARI HIROYUKI Graduate School of Engineering Assistant Professor,OKAMOTO TAKAAKI Graduate School of Engineering Assistant Professor,Yuma Shimizu Graduate School of Global Environmental Studies Assistant Professor,田中 智大 Academic Center for Computing and Media Studies Assistant Professor,TORIU DAISUKE Disaster Prevention Research Institute Assistant Professor,NOHARA DAISUKE Disaster Prevention Research Institute Assistant Professor,MIYASHITA TAKUYA Disaster Prevention Research Institute Assistant Professor,Yamanoi Kazuki
Target year	3rd year students or above
Number of credits	2
Year/semesters	2020/Second semester
~~Days and periods~~	~~Thu.3,4~~
~~Class style~~	~~Experiment~~
~~Language of instruction~~	~~English~~

Continue to Experiments on Hydraulics(2)↓↓↓

Experiments on Hydraulics(3)

[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 33527 LE73		
Course title (and course title in English)	Public Economics Public Economics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA Disaster Prevention Research Institute Associate Professor,YOKOMATSU MUNETA Graduate School of Engineering Assistant Professor,SEGI SHUNSUKE
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Thu.1	Class style	Lecture
Language of instruction	English		

[Overview and purpose of the course]

The purpose of this lecture is to understand the basic concept of micro economics to evaluate infrastructure projects. For the sake of this purpose, the detailed concept of micro economics is explained including the function of the market, the behaviour of firms and consumers, and the methodology to evaluate the social welfare is explained. The concept of market failure and policies to conquer it are also explained. Finally, cost benefit analysis which is wildy used to evaluate the efficiency of infrastracture is explained with economical aspects of infrastructure.

[Course objectives]

To understand the basic concept of micro economics for project evaluation of infrastructure

[Course schedule and contents]

Introduction,1time,The outline of this course, the role of public
Consumers#039 behaviour,2times,Consumers#039 behaviour model (the preference of household, utility, utility maximisation behaviour, demand function, compensated demabd function, Slutsky equation, aggregated demand fuction, welfare measures and their feature)
Exercise (1),1time,Exercise related to above three lectures
Firms#039 behaviour,2times,Firms#039 behaviour (technology, production function, profit maximisation behavior, cost minimisation behaviour, cost function and supply function, market structure and firms#039 behaviour)
Exercise (2),1time,Exercise related to above three lectures
Perfect Comitive Market,1time,Perfect competitive market, the difference between general equiribrium and partial equiribrium, Pareto effciency
Imperfect Competition,1time,Monopolistic Market, Oligopoly Market
Measurement for Economic Evaluation,1time,Consumers#039 surplus, Producers#039 surplus, social surplus, equivalent variation, compensating variation
Externality,1time,The concept of externalities, its mechanism and variation, policy to internalise externalities
Public Goods,1time,The feature of public goods, Samuelson condition
Exercise (3),1time,Exercise related to above three lectures
Cost Benefit Analysis,1time,The concept of cost and benefit, social discount rate, evaluation index, cost benefit analysis and financial analysis, quantification of the benefit, the way of pjofect evaluation from the viewpoint of engineers#039 ethic
,1time,

[Course requirements]

Students are supposed to have earned a credit for quotSystems Analysis and Exercises for Planning and Managementquot

Continue to Public Economics(2)↓↓↓

未更新

Course number	U-ENG23 33528 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	2020/Second semester		
Days and periods	Mon.4	Class style	Lecture
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]

Introduction to Urban and Regional Planning,1time,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.
Histroy of Urban Planning in Japan,1time,Historical background of urban planning in pre-war Japan.
Land-use Planning and District Planning,3times,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.
Environmental Issues and Urban Systems,2times,Environmental issues, contemporary challenges and planning requirements of regional and urban environment from the environmental economics point of view.
Current Urban Development,1time,Current trends of the urban and regional planning such as eco-towns and smart growth.
Basic Theory of Urban Transport Policy,1time,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).
Urban Transport Policy,3times,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.
Urban Transportation Planning,2times,Basic concepts and models of the four-step transportation model will be discussed.
,1time,

Continue to Urban and Regional Planning(2)↓↓↓

Public Economics(2)

[Evaluation methods and policy]

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

[Textbooks]

Hal R. Varian: Intermediate Microeconomics : A Modern Approach, seventh Edition, W. W. Norton amp Company, 2014 isbn{}{9780393919677}

[References, etc.]

（**Reference books**）

[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.)）

*Please visit KULASIS to find out about office hours.

Urban and Regional Planning(2)

[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)]

（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.

未更新

Course number	U-ENG23 33529 LE73　U-ENG23 33529 LE77		
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	2020/Second semester
Days and periods	Mon.3	Class style	Lecture	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 each method appropriately.

[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.

[Course schedule and contents]

Introduction,2times,The role of transport in the city and the role of motorisation. Definition of Transportation planning and traffic engineering. Status of transport in cities and current global transport planning problems.
Observing and analysing travel behaviour,2times,Purpose of travel surveys, in particular person trip surveys. How to analyse travel behaviour with these and how to use these data.
Road network survey and analysis,2times,Explaining methods for road traffic flow and travel demand estimation.
Traffic Flow Theory,3times,Mechanisms of congestion, characteristics of traffic flow and traffic flow models, traffic capacity of road.
Traffic operations,3times,Grade intersection, Traffic capacity at intersections, traffic signal control methods
Traffic management methods,3times,Introduction to the various traffic management techniques currently being implemented, their benefits and challenges.

[Course requirements]

None

[Evaluation methods and policy]

Joined judgement of report and end term exam.

[Textbooks]

None

[References, etc.]

（**Reference books**）

Iida, Kitamura: Traffic Engineering. 2008. isbn{}{9784274206382}

Continue to Transportation Management Engineering(2)↓↓↓

Course number	U-ENG23 33530 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 Graduate School of Engineering Professor,KIMURA MAKOTO Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE

Target year	3rd year students or above	Number of credits	2	Year/semesters	2020/Second semester
Days and periods	Tue.1	Class style	Lecture	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,6times,Remediation of contaminated soils and groundwaters, waste containment, and reuse of waste materials in geotechnical applications, are introduced
Ground improvement,2times,Principles of ground improvement are introduced
Geo-disaster,2times,Measures against geo-disasters are introduced
Remedial technics,4times,Remedial technics are introduced
Class feedback,1time,Confirmation of understanding

[Course requirements]

Soil mechanics I and Exercises (35080)

[Evaluation methods and policy]

Final exam (70%) and class works (30%)

[Textbooks]

Handouts will be distributed.

[References, etc.]

（**Reference books**）

Lakshmi N. Reddy, Hilary I. Inyang, ldquoGeoenvironmental Engineering: Principles and Applicationsrdquo, Marcel Dekker, Inc. isbn{}{0824700457}
Robert W. Sarsby, ldquoEnvirionmental Geotechnicsrdquo, ICE publishing isbn{}{9780727741875}

Continue to Geoenvironmental Engineering(2)↓↓↓

Transportation Management Engineering(2)

Roess R.P, Prassas E. S, McShane W.R (2004) Traffic Engineering, 4th Ed, Prentice Hall. isbn{}{ 9780136135739}
Further useful material will be introduced during the class.

（**Related URLs**）

(None)

[Study outside of class (preparation and review)]

（**Other information (office hours, etc.)**）

It is recommended to take this course jointly with quotUrban and Regional Planningquot taught by Assoc. Prof. Ali Qureshi on Mondays, 3rd period, as some exercises will be conducted jointly.

*Please visit KULASIS to find out about office hours.

Geoenvironmental Engineering(2)

[Study outside of class (preparation and review)]

There is one lecture for which Computer programming using FORTRAN is practiced; so please review FORTRAN and bring your own device to the class on the day specified by instructor.

（**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
Construction and industrial projects involvement for 5-10 years.

(3) Details of practical classes delivered based on instructors' practical work experience
Classes are given based on the practical experiences.

未更新

Course number	U-ENG23 33531 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 Associate Professor,PIPATPONGSA, Thirapong
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Tue.2	Class style	Lecture
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. Still, rock mass is different from concrete because it is not merely a mixture of materials binding together but it has undergone geological proces 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]

1) Introduction to Rock Engineering
2) Strength of intact rock
3) Discontinuity and surface roughness
4) Description of discontinuous planes
5) Griffith and Hoek-Brown failure criteria
6) Fractures in rock mass
7) Hydro-mechanical behaviors in rock
8) Mid-term examination
9) Geological survey and geophysics
10) Seepage in fractured rock
11) Subsurface stresses and measurements
12) Application to tunnel & Rock mass rating system
13) Application to plane failure of slope
14) Application to wedge failure of slope
15) Evaluation of understanding

Continue to Rock Engineering(2)↓↓↓

未更新

Course number	U-ENG23 33532 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 Senior Lecturer,Chang, Kai-Chun Graduate School of Engineering KANKEI KYOIN
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Tue.4	Class style	Lecture
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 of how technology and knowledge is applied and integrated for a safe, comfortable and sustainable society. This class consists of lectures not only from academic staffs but also visiting lecturers and it is expected to comprehensive teach what is Civil Engineering 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 disaster, 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,2times,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,7times,It is explained how technology and knowledge cultivated in Civil Engineering contributes to the promotion of social infrastructure, prevention or diminishment 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 currentresearches in Civil Engineering,5times,Firstly, the research trend in Civil Engineering, which aims to realise 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,1time,The achievement of the lecture is assessed.

[Course requirements]

None

[Evaluation methods and policy]

The grade is evaluated based on the record of attendance and reports assigned by lecturers.

Continue to Design for Infrastructure II(2)↓↓↓

Rock Engineering(2)

[Course requirements]

None

[Evaluation methods and policy]

Mid-term exam (35%), Final exam (40%), report and classworks (25%)

[Textbooks]

Some handouts are distributed thru KULASIS or PanDA.

[References, etc.]

（**Reference books**）
ldquoIntroduction to Rock Mechanicsrdquo, R.E. Goodman, John Wiley amp Sons isbn{}{0471617180}
ldquoEngineering Rock Mechanicsrdquo, J.A. Hudson and J.P. Harrison, Pergamon isbn{}{9780080438641}

ldquoFundamentals of Rock Mechanicsrdquo, J.C. Jaeger, N.G.W. Cook and R.W. Zimmerman, Blackwell Publishing isbn{}{9780632057597}
ldquoRock Mechanicsrdquo, Society of Materials Science, Japan (in Japanese) isbn{}{4765516288}

[Study outside of class (preparation and review)]

Quiz during lecture encourages students to review lecture contents before class.

（Other information (office hours, etc.)）

Prof. Kiyoshi KISHIDA
Office: Department of Urban Management, C1-3-265
E-mail: kishida.kiyoshi.3r@kyoto-u.ac.jp
Assoc.Prof. Thirapong PIPATPONGSA
Office: Department of Urban Management, C1-2-236
E-mail: pipatpongsa.thirapong.4s@kyoto-u.ac.jp)

*Please visit KULASIS to find out about office hours.

Design for Infrastructure II(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.

[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 33534 PE73		
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	2020/Second semester		
Days and periods	Wed.1	Class style	Lecture
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]

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 hydrologic frequency analysis, distribution functions used for the frequency analysis, and estimation methods

Continue to Water Resources Engineering(2)↓↓↓

Water Resources Engineering(2)

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. Minimum passing grade is sixty percent.

[Textbooks]

Not used

[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.)）

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 33535 LE73		
Course title (and course title in English)	River Engineering River Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HOSODA TAKASHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Disaster Prevention Research Institute Associate Professor,TAKEMON YASUHIRO
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Wed.2	Class style	Lecture
Language of instruction	English		

[Overview and purpose of the course]

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

[Course objectives]

The objectives of this subject are to understand the basic knowledge to consider river environments from the various points of view such as flood control, natural environment conservation, water utilization based on natural science, social sciences and engineering amp technology.

[Course schedule and contents]

Various viewpoints on rivers and river basins,1time,Various viewpoints on rivers and river basins, Vvrious rivers and their landscapes on the Earth, formation processes of river basins, long term environmental changes of rivers and main factors
Precipitation, water cycle and run-off phenomena,1time,Basic knowledge on Meteorology, Water Resources, Statistical Hydrology of precipitation and Rain Fall Run-off Analysis
River flow and river channel processes,2times,Basics on unsteady open channel flows andflood flow simulation, sediment transport in alluvial streams, formation processes of sand bars, etc.
Application of numerical hydraulics to environmental issues,1time,Relation between the behavior of an endangered bird called #039Kamogawa-Chidori#039 and sand-bar formation, Mechanism on DO depletion near the bottom of the northern part of Lake Biwa due to climate change, Dam reservoir sedimentation due to sediment run-off from a catchment area, etc.
Structure and functions of river and lake eco-system,3times,(1) Hierarchical structure and classification of river ecosystems, Relations between river geomorphology and habitat structure, Classification of microhabitats and their maintenance mechanisms, Longitudinal distribution of biological communities (2) Function of river ecosystems, Roles of biodiversity, Sustainable conditions of habitats for biological communities, Mass transfer mechanism in rivers, Nutrient spiraling, Impact assessment of river environments and Physical Habitat Simulation Model (3) Function of lake ecosystems, Classification of natural lakes and ponds by thermal stratification and thermal convection, Relations between lake types and biota (fauna and flora), Characteristics of man-made reservoir ecosystems
Integrated river basin planning,3times,(1) River environmental improvement plan, Normal discharge, River restoration projects, Environmental assessment, etc. (2) Classification of river structures and their functions, Impact assessment for construction of dam reservoirs and estuary barrages, etc. (3) Comprehensive management of sediment outflow and sediment budgets in river basins, concepts of recent sediment control

Continue to River Engineering(2)↓↓↓

River Engineering(2)

dams, asset management of dam reservoirs, management of sediment dynamism for integrated river planning, etc.
Integrated river basin planning,3times,(1) River environmental improvement plan, Normal discharge, River restoration projects, Environmental assessment, etc. (2) Classification of river structures and their functions, Impact assessment for construction of dam reservoirs and estuary barrages, etc. (3) Comprehensive management of sediment outflow and sediment budgets in river basins, concepts of recent sediment control dams, asset management of dam reservoirs, management of sediment dynamism for integrated river planning, etc.
Confirmation of understanding,1time,Students can check their understanding giving questions to Hosoda and Takemon.

[Course requirements]

Elementary knowledge of Hydraulics, Hydrology and Ecology

[Evaluation methods and policy]

Mainly regular examination. Quiz in classes, attendance and reports are considered for grading to some extent.

[Textbooks]

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

[References, etc.]

（**Reference books**）

（**Related URLs**）

(http://www.geocities.jp/kyoto_u_rivereng/)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33536 LE73		
Course title (and course title in English)	International Internship International Internship	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Intensive, Second semester		
Days and periods	Intensive	Class style	Practical training
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]

Implementation of Internship,Corresponding to two weeks - one month internship in August or Septembertimes,Practice internship. After implementation of internship, students should submit daily work report to instructer.
Individual report meeting,1(October)times,Instructer will arrange indivisual report meeting. Individual meeting will be hold by selected interviewer (facaluty teacher).\ Students should report to interviewer in this meeting.
Final report meeting ,1 (November)times,Instructer will arrange final report meeting. Each students should present output of internship in this meeting. \Student should report to interviewer 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)↓↓↓

未更新

Course number	U-ENG23 33537 EE73		
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 Global Environmental Studies Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.3	Class style	Lecture
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]

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 is 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 (vortex-induced vibration, galloping, flutter, buffeting, 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

Continue to E & WR of S, & RSDP(2)↓↓↓

International Internship(2)

[References, etc.]

（**Reference books**）
None

[Study outside of class (preparation and review)]

（**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

E & WR of S, & RSDP(2)

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(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)]

（**Other information (office hours, etc.)**）

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

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG27 27225 LJ61		
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	2020/Second semester		
Days and periods	Wed.5	Class style	Lecture
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,1time,Introduction of concrete structures (RCampPC)
Fundamental of design,2times,Design code and specifications
Materials,1time,The mechanical behavior of concrete, reinforcing steel and others are explained
Bonding behavior,2times,The mechanism of bonding between concrete and steel
Flexural behavior,2times,The mechanical behavior and the capacity of RC section subjected to the flexural moment and/or the uniaxial force are explained
Shear behavior,2times,The mechanical behavior and the capacity of RC section subjected to the shear are explained.
Crack and deflection,2times,Cracking mechanism and evaluation of deflection of RC member are explained.
Prestressed concrete I,1time,Effects of Prestressing\ Prestressing steel\ concrete for prestressed construction
Prestressed concrete II,1time,Elastic flexural analysis\ Flexural strength
Confirmation of understanding of lecture,1time,A confirmation of understanding of lecture is examined

[Course requirements]

Students of this class had better take lsquoStructural Mechanics I and Exercises (30080)rsquo in 2nd year and lsquoConstruction Materials (30240)rsquo in 3rd year.

[Evaluation methods and policy]

Grading is based on the result of final examination and reports.

Continue to Concrete Engineering(2)↓↓↓

Course number	U-ENG23 43538 GE14 U-ENG23 43538 GE73		
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,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute Professor,IGARASHI AKIRA Disaster Prevention Research Institute Professor,SAWADA SUMIO Graduate School of Engineering Associate Professor,AN RIN Graduate School of Engineering Associate Professor,KITANE YASUO Graduate School of Engineering Associate Professor,SAITOU JIYUN Graduate School of Engineering Associate Professor,FURUKAWA AIKO Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Senior Lecturer,Chang, Kai-Chun Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/Second semester		
Days and periods	Fri.4,5	Class style	Seminar
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 practical failure structures

Structural Experiment, 6 times
Introducing fundamentals of experiment method and measurement technique for structure model, 5

Continue to CP & Exp on Struct M(2)↓↓↓

Concrete Engineering(2)

[Textbooks]

Arthur H.Nilson, David Darwin and Charles W.Dolan: Design of Concrete Structures, Mc Graw Hill,2010 isbn{}{0073293490}

[References, etc.]

（**Reference books**）
K. Kobayashi: Concrete Engineering, Morikita Publishing Co., Ltd., 3,240JPY isbn{}{9784627425651}
James K.Wight, James G.MacGregor: Reinforced Concrete Mechanics amp Design, Pearson,2010 isbn{}{ 9780132176521}

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

CP & Exp on Struct M(2)

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 Ⅰand Exercises, Structure mechanics Ⅱ 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]

To be distributed in lectures

[References, etc.]

（**Reference books**）

[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.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG25 45170 SJ71		
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,YAMADA TADASHI Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI
Target year	4th year students or above	Number of credits	5
Year/semesters	2020/Intensive, year-round		
Days and periods	Intensive	Class style	Seminar
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

Continue to Graduation Research(2)↓↓↓

Course number	U-ENG26 36117 LJ72		
Course title (and course title in English)	Coastal Engineering Coastal Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,KHAYYER, Abbas Graduate School of Global Environmental Studies Associate Professor,HARADA EIJI Graduate School of Engineering Assistant Professor,IKARI HIROYUKI Graduate School of Engineering Assistant Professor,Yuma Shimizu
Target year	3rd year students or above	Number of credits	2
Year/semesters	2020/First semester		
Days and periods	Tue.4	Class style	Lecture
Language of instruction	English		

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

Introduction to Coastal Engineering[1time]:
Introduction to coastal engineering with focusing on beach deformation

Small Amplitude wave theory[2times]:
Characteristics of small amplitude wave theory and its application are explained.

Wave Statistics / Wave Transformation[2times]:
Developing process of wind wave and expression method of irregular waves are explained. Mechanics of wave transformation is outlined.

Wave Force on Coastal Structures[1time]:
Several experimental formulae of wave force acting on coastal structures are introduced. Problems for stability of rubble mound is mentioned.

Design of Coastal Structures (Exercise)[1time]:
Exercise of design of coastal structures.

Introduction to Computational Design of Coastal Structures[1time]:
State-of-the-art numerical wave flume and its applications are explained.

Sediment Hydraulics[4times]:
Sediment hydraulics (i.e., basic characteristics, calculation of river-bed, bed load and suspended load, non-

Continue to Coastal Engineering(2)↓↓↓

Graduation Research(2)

[Textbooks]

consult with supervisor

[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.

Coastal Engineering(2)

equilibrium sediment transport) is explained.

Nearshore Current / Coastal Sediment Transport[1time]:
Near-shore current due to wave deformation and resultant coastal sediment transport are outlined.

Tsunami and Storm Surge: Evacuation Planning under Coastal Disasters[1time]:
Characteristics of tsunami and storm surge are explained. Additionally, evacuation process and evacuation planning are introduced.

Achievement confirmation[1time]:
Comprehension check of course contents.

Feedback

[Course requirements]

To have already completed the class of Hydraulics and Exercises is desirable.

[Evaluation methods and policy]

Based on the results of examinations

[Textbooks]

Handout is used in the lectures as needed.

[References, etc.]

(**Reference books**)
Supplemental textbook is announced in the first lecture.

(**Related URLs**)
(Non)

[Study outside of class (preparation and review)]

Review the lecture contents.

(**Other information (office hours, etc.)**)

Reexamination is not provided.
How to contact with instructors is announced in the first lecture.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 43999 GJ14　U-ENG23 43999 GJ73　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 Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI

Target year	4th year students or above	Number of credits	5	Year/semesters	2020/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	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.

Continue to 特別研究(土木工学コース)(2)↓↓↓

Course number	U-ENG23 43999 GJ14　U-ENG23 43999 GJ73　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 Energy Science Professor,FUJIMOTO HITOSHI Graduate School of Energy Science Associate Professor,KUSUDA HIROMU

Target year	4th year students or above	Number of credits	5	Year/semesters	2020/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	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(土木工学コース)(2)

[Textbooks]

consult with your supervisor

[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.

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 GJ14　U-ENG23 43999 GJ73　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,TAKAOKA MASAKI Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year	4th year students or above	Number of credits	5	Year/semesters	2020/Intensive, year-round
Days and periods	Intensive	Class style	Seminar	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.