Course number	U-ENG23 22051 LJ55

Course title (and course title in English)	B1　T1　T2 Engineering Mathematics B1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,HARADA EIJI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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.

B1　T1　T2　(2)

None.

Reference books

Useful material is introduced during the lecture.

Basic Calculus

KULASIS system will be used to contact with registered students.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 22051 LJ55		

Course title (and course title in English)	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**	2022/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.

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-ENG23 13001 LJ73　U-ENG23 13001 LJ77		
Course title (and course title in English)	Introduction to Global Engineering	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering KANKEI KYOIN Graduate School of Management Associate Professor,OOBA TETSUHARU Graduate School of Engineering Professor,SUGIURA KUNITOMO
Target year	1st year students or above	**Number of credits** 2	**Year/semesters** 2022/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)	(T1) Probabilistic and Statistical Analysis and Exercise	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,TAKAYUKI KAMEDA Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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

- -

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)	(T2) Probabilistic and Statistical Analysis and Exercise	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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

(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)	(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	2022/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

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)	(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	2022/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

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 13004 SJ10

Course title (and course title in English)	(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 Associate Professor,YANO JUNYA

Target year	1st year students or above	Number of credits	2	Year/semesters	2022/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.

Course number	U-ENG23 13004 SJ10

Course title (and course title in English)	(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	2022/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.

Course number	U-ENG23 13004 SJ10

Course title (and course title in English)	(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	2022/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.

Course number	U-ENG23 13004 SJ10		

Course title (and course title in English)	(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	2022/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.

Course number	U-ENG23 23005 LJ55

Course title (and course title in English)	T1 Mathematics for Global Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Associate Professor,FURUKAWA AIKO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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.

Course number	U-ENG23 23005 LJ55		

Course title (and course title in English)	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	2022/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.

Course number	U-ENG23 23005 LJ55			
Course title (and course title in English)	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 Professor,HIRAI YASUHIRO
Target year	2nd year students or above	**Number of credits**	2	**Year/semesters**	2022/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.

Course number	U-ENG23 23005 LJ55		

Course title (and course title in English)	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	2022/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.

Course number	U-ENG23 23008 LJ73

Course title (and course title in English)	Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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]

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

[Course requirements]

Calculus A and B

(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

Reference books

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

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73		

Course title (and course title in English)	Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIURA KUNITOMO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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]

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

[Course requirements]

Calculus A and B

(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

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

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73

Course title (and course title in English)	Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YAGI TOMOMI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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]

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

[Course requirements]

Calculus A and B

(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

Reference books

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

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73

Course title (and course title in English)	Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KIYONO JIYUNJI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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]

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

[Course requirements]

Calculus A and B

(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

Reference books

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

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73		

Course title (and course title in English)	Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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]

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

[Course requirements]

Calculus A and B

(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

   Reference books

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

[Study outside of class (preparation and review)]

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

  Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23010 LJ57

Course title (and course title in English)	(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	2022/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.

(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)	(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	2022/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.

(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.

Course number	U-ENG23 13014 LJ90　U-ENG23 13014 LJ15

Course title (and course title in English)	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 Assistant Professor,HONDA AKIKO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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.

(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

Course number	U-ENG23 23015 LJ15

Course title (and course title in English)	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	2022/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.

(2)

[Textbooks]

Bruce Alberts　Essential　　　　　　(　　4　) 　　　　　　　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.

Course number	U-ENG23 33024 LJ73			

Course title (and course title in English)	Construction Materials	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

(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: Takashi Yamamoto at rm C1-455, 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 33025 LJ73

Course title (and course title in English)	Concrete Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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.

(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.

Course number	U-ENG23 33030 LJ73		

Course title (and course title in English)	Fundamentals of Hydrology	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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]

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

explained.

10. Solar radiation and energy balance: Energy and water cycle driven by solar radiation is described. Basic mechanism of global warming ant its influence on hydrologic cycle is introduced.

11-13. Evaporaion and transpiration: The mechanism of water and energy cycle through evapotranspiration is described. Energy balance at land surface and the wind of boundary layer is introduced. Then, methods to measure the evapotranspiration is described.

14. Flood routing: The mechanism of flood routing is explained. Numerical representation method to represent channel network structure is introduced, then typical flow routing methods are described.

<< Examination >>: Final examination is conducted.

15. Feedback: Questions from students are accepted.

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

, 2006   ISBN:9784254264784

[References, etc.]

Reference books

,2010

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33032 LJ73				

Course title (and course title in English)	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	2022/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.

(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.

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

Course title (and course title in English)	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 Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

(2)

- -

[Course requirements]

Fundamental understanding of probability

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

Reference books
Introduced during class

Related URLs
(None)

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

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

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

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

Course number	U-ENG23 33045 LJ73		

Course title (and course title in English)	Urban and Regional Planning	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI Graduate School of Engineering Assistant Professor,TANAKA KOSUKE

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

(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.

Course number	U-ENG23 33053 LJ73 U-ENG23 33053 LJ14		

Course title (and course title in English)	Water Quality	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,Fujiwara Taku Graduate School of Global Environmental Studies Associate Professor,TANAKA SHUHEI Graduate School of Engineering Associate Professor,NISHIMURA FUMITAKE

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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.

Course number	U-ENG23 33054 LJ16 U-ENG23 33054 LJ73

Course title (and course title in English)	Water Supply Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ITOH SADAHIKO Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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.

(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.

Course number	U-ENG23 33055 LJ16 U-ENG23 33055 LJ73		
Course title (and course title in English)	Sewerage System Engineering	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,Fujiwara Taku 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** 2022/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[2 weeks]:
Introduction on sewerage system and course guidance. Roles and significance of sewerage system for creation of desirable water environment and management. Type of sewerage system, comprehensive basin-wide planning of sewerage systems, relationship among the sewerage-like facilities such as Jokaso and drainage facilities for agricultural communities. Engineering ethics.

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

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

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

(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.

(2)

- -

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

(7) Final examination/ Learning achievement evaluation

(8) Feedback

[Course requirements]

Water quality engineering, hydraulics

[Evaluation methods and policy]

Evaluation will be based on the written examination.

[Textbooks]

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 LJ77 U-ENG23 33057 LJ15			
Course title (and course title in English)	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**	2022/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   rays, rays, and   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.

(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.

Course number	U-ENG23 33058 LJ17 U-ENG23 33058 LJ16 U-ENG23 33058 LJ77

Course title (and course title in English)	Solid Waste Management	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,TAKAOKA MASAKI Agency for Health, Safety and Environment Professor,HIRAI YASUHIRO

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/Second semester

Days and periods	Mon.3	**Class style**	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

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

(2)

14. Evaluation and management of environmental impact associated with waste treatment (2) LCA (Hirai)
<<Final examination>>
15. Feedback

[Course requirements]

None

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

Reference books
To be announced in class.

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33059 LJ16 U-ENG23 33059 LJ73 U-ENG23 33059 LJ76		
Course title (and course title in English)	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,KUSAKABE TAKETOSHI
Target year	3rd year students or above	**Number of credits** 2	**Year/semesters** 2022/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

(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

ISBN:9784254250237
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

Course number	U-ENG23 33076 LJ77 U-ENG23 33076 LJ72		

Course title (and course title in English)	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	2022/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.

Course number	U-ENG23 33077 LJ77			
Course title (and course title in English)	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** 2022/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

(2)

[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 33085 LJ73		

Course title (and course title in English)	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 Global Environmental Studies Assistant Professor,KOTANI HITOMU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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   (2)

(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]

ISBN:9784339056402

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

[References, etc.]

Reference books

ISBN:4627494610

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43086 EJ73

Course title (and course title in English)	Construction Materials, Laboratory	**Instructor's name, job title, and department of affiliation**	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor,UEMURA KEITA Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI

Target year	4th year students or above	**Number of credits**	2	**Year/semesters**	2022/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.

(2)

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

Reference books

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33087 EJ73

Course title (and course title in English)	(R1) Experiments on Hydraulics(Enrolled before 2019)	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,KAWAIKE KENJI Disaster Prevention Research Institute Professor,MORI NOBUHITO Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Engineering Associate Professor,HARADA EIJI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,SHIMURA TOMOYA Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI 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 Engineering Assistant Professor,TANAKA TOMOHIRO Academic Center for Computing and Media Studies Assistant Professor,TORIU 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	2022/Second semester
Days and periods	Thu.3,4	Class style	Experiment	Language of instruction	Japanese

(R1   )(2)

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

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

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

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

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

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

- -

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

Hydraulic experiment instruction manual (distributed on KULASIS)

[References, etc.]

Reference books

(, 2022)   ISBN:978-4-627-67671-8

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33107 LJ73

Course title (and course title in English)	II Soil Mechanics II and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KIMURA MAKOTO Graduate School of Management Professor,HIGO YOUSUKE Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Engineering Associate Professor,SAWAMURA YASUO

Target year	3rd year students or above	Number of credits	3	Year/semesters	2022/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

- -

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

- -

II　　　　　(3)

(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)	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	2022/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.

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.

(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.

Course number	U-ENG23 33117 LJ73		

Course title (and course title in English)	Continuum Mechanics	**Instructor's name, job title, and department of affiliation**	Graduate School of Management Professor,HIGO YOUSUKE Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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.

[Course requirements]

Basic understanding on differential and integral calculus and linear algebra

(2)

[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.

Course number	U-ENG23 23132 LJ16 U-ENG23 23132 LJ17

Course title (and course title in English)	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	2022/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.

(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
4 to 6 visiting lecturers from government agencies, consultants, think tanks, plant manufacturers

(3) Details of practical classes delivered based on instructors' practical work experience
Lectures on the role of environmental engineering in society by members of companies and government

Course number	U-ENG23 23133 LJ77　U-ENG23 23133 LJ28				
Course title (and course title in English)	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**	2022/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.

Course number	U-ENG23 23134 LJ73		
Course title (and course title in English)	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 Associate Professor,FUJIMI TOSHIO Graduate School of Management Associate Professor,OOBA TETSUHARU Graduate School of Engineering Assistant Professor,TANAKA KOSUKE Graduate School of Engineering Assistant Professor,NAKAO SATOSHI

Target year	2nd year students or above	**Number of credits**	2	**Year/semesters**	2022/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.

Course number	U-ENG23 33138 EJ73

Course title (and course title in English)	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 Management Professor,HIGO YOUSUKE 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 Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,KIDO RYUNOSUKE Graduate School of Engineering Assistant Professor,SAWADA MAI Graduate School of Engineering Assistant Professor,MIYAZAKI YUSUKE Graduate School of Global Environmental Studies Assistant Professor,KATO TOMOHIRO Disaster Prevention Research Institute Associate Professor,UEDA KYOHEI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

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.

(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

Course number	U-ENG23 33139 LJ16 U-ENG23 33139 LJ73		

Course title (and course title in English)	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	2022/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.

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.

Course number	U-ENG23 33140 LJ14 U-ENG23 33140 LJ15

Course title (and course title in English)	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	2022/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, 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

(2)

[Course requirements]

[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   :3R

[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

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

Target year	3rd year students or above	Number of credits	3	Year/semesters	2022/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]

[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

Course number	U-ENG23 33144 LJ77		

Course title (and course title in English)	Advanced Resources and Energy Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Professor,TSUKADA KAZUHIKO Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Energy Science Professor,FUJIMOTO HITOSHI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Professor,MIKADA HITOSHI Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

(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

Course number	U-ENG23 33147 PJ16　　U-ENG23 33147 PJ73　　U-ENG23 33147 PJ17		

Course title (and course title in English)	（　　　　　　　　　） Spot Trainning	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Associate Professor,KITANE YASUO Graduate School of Engineering Associate Professor,ONDA SHINICHIROU

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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

(   )(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

Course number	U-ENG23 33147 PJ16　　U-ENG23 33147 PJ73　　U-ENG23 33147 PJ17

Course title (and course title in English)	(　　　　　　　　) 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	2022/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

(   )(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.

Course number	U-ENG23 33148 LJ73			

Course title (and course title in English)	Geoinformatics	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,SUSAKI JUNICHI Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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).

(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

Reference books

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

[Study outside of class (preparation and review)]

Nothing

Other information (office hours, etc.)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33149 EJ73		

Course title (and course title in English)	Computer Programming and Experiment on Structural Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering 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,UEMURA KEITA 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	2022/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)

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   and Exercises, Structure mechanics 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)	Earthquake and Wind Resistance of Structures, and Related Structural Design Principles	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute 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	2022/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

(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.

Course number	U-ENG23 33151 LJ73		

Course title (and course title in English)	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**	2022/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

(2)

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

Course number	U-ENG23 33152 LJ73

Course title (and course title in English)	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	2022/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}.

(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.

Course number	U-ENG23 33154 EJ15　　U-ENG23 33154 EJ76　　U-ENG23 33154 EJ16		

Course title (and course title in English)	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 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 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	2022/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.

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

[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

Course number	U-ENG23 33155 LJ71 U-ENG23 33155 LJ58 U-ENG23 33155 LJ77		

Course title (and course title in English)	Wave Motions for Engineering	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,MIKADA HITOSHI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,XU Shibo

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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 ,   times,Furthermore, the degree of study achievement is checked about whether an

(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

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

Course number	U-ENG23 33156 LJ71

Course title (and course title in English)	Thermo-Fluid Engineeering	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,FUJIMOTO HITOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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.

Course number	U-ENG23 33157 EJ77

Course title (and course title in English)	Materials testing for mineral science and technology	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Associate Professor,NARA YOSHITAKA Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA Graduate School of Energy Science Assistant Professor,CHIN YUUSEI Graduate School of Engineering Assistant Professor,YOSHIMITSU NANA

Target year	3rd year students or above	Number of credits	1	Year/semesters	2022/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: 1 time.
The course goals, schedule of this class, and various attention for safety are presented.

Material testing and failure criterion of rock: 4.5 times.
Overview of the rock material testing, the method to obtain Young's modulus, Poisson's ratio, uniaxial compressive strength, and tensile strength are explained. First, in this theme, rock specimen is prepared. Second, uniaxial compression test is conducted. During the uniaxial compression test, strain measurement using strain gauges is performed, and the uniaxial compressive strength, Young's modulus and Poisson's ratio are determined. Third, Brazilian test is conducted and the tensile strength is determined. Finally, the failure criterion of the specimen is determined.

Tensile test and mechanical properties of sheet metals: 4.5 times.
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: 4.5 times.
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.

(2)

[Course requirements]

It is desirable that students take "Experimental Basics in Earth Resources and Energy Science, Laboratory" offered in the previous semester. It is also desirable to take "Materials and Plasticity", "Rock Engineering", and "Geological and Geophysical Survey, Field Excavation" for the 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)]

Class attendance is mandatory.

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.

Course number	U-ENG23 33159 LJ77　U-ENG23 33159 LJ28		

Course title (and course title in English)	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**	2022/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

(2)

[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 23162 LJ73

Course title (and course title in English)	Soil Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Engineering Professor,KIMURA MAKOTO Graduate School of Management Professor,HIGO YOUSUKE Graduate School of Engineering Professor,MIMURA MAMORU Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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.

(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

Course number	U-ENG23 33163 LJ73

Course title (and course title in English)	Urban and Landscape Design	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KAWASAKI MASASHI Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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%).

(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.

Course number	U-ENG23 33164 LJ73

Course title (and course title in English)	II (A) 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	2022/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,IntroductionWork, virtual work and energyCastiglianorsquos theorems and principle of minimum potential energyVirtual work and complementary virtual workPrinciple of virtual work (virtual displacement)Principle of complementary virtual work(virtual force)Reciprocal theorems
Static determinate and indeterminate,1time,Degree of freedom and degree of indeterminacy
Solutions to statically indeterminate structures,6times,Introduction of force method and displacement methodBy equations of elasticityBy displacement method
Structural stability,3times,Stability criteriaDeformation of rigid body-elastic spring systemDeformation of elastic beam- column system
Basis of matrix method of structural analysis,4 times,Matrix adapted to equilibrium equations/displacement conditionsAnalysis of plane truss
Structral analysis engineer#039s ethics,1time,Examples on structral analysis engineer#039s ethics related to safety of structure analyses such as application scope, precision of analysis and reliability of structural analysis
Confirmation of the attainment level of learning,2times,Confirm the attainment level of learning

[Course requirements]

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

II   (A   )(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   , 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.

Course number	U-ENG23 33164 LJ73

Course title (and course title in English)	II (B) 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	2022/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   and Exercises

[Evaluation methods and policy]

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

II　　　　(B　)(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 , 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.

Course number	U-ENG23 33164 LJ73

Course title (and course title in English)	II (C) 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**	2022/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   and Exercises

[Evaluation methods and policy]

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

II   (C   )(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 , 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.

Course number	U-ENG23 33165 LJ71

Course title (and course title in English)	Fluid Mechanics		Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,FUJIMOTO HITOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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 33166 LJ77

| Course title (and course title in English) | 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	2022/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.

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

Course title (and course title in English)	B2( ) 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	2022/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.

B2(   )(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 introduced 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.

Course number	U-ENG23 33174 LJ55　　U-ENG23 33174 LJ77

Course title (and course title in English)	B2(　　　　　　　　) 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	2022/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.

Course number	U-ENG23 33175 LJ77　　U-ENG23 33175 LJ73

Course title (and course title in English)	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	2022/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 constrution of tunnels in the mountain region and representative shield method for tunneling at city area are also explained. Simple design exercises and special lecture from experienced person

(   )(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]

Not used

[References, etc.]

Reference books

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

[Study outside of class (preparation and review)]

Quizzes are handed out through PandA.

Other information (office hours, etc.)

Office hour will be explained at the guidance.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23176 LJ77

Course title (and course title in English)	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	2022/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.

(　　　　　　　　　)(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

Course number	U-ENG23 43177 LJ73

Course title (and course title in English)	A Design Exercise for Global Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KAWASAKI MASASHI Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA Part-time Lecturer,NAGAHAMA NOBUTAKA Part-time Lecturer,NIWA NOBUHIRO Part-time Lecturer,YAGI HIROKI

Target year	4th year students or above	Number of credits	2	Year/semesters	2022/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.

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 43178 LJ77

Course title (and course title in English)	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,HAMA TAKAYUKI Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Energy Science Professor,FUJIMOTO HITOSHI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI Graduate School of Energy Science Associate Professor,KUSUDA HIROMU Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA Graduate School of Engineering Associate Professor,MURATA SUMIHIKO Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA Graduate School of Engineering Assistant Professor,KUBO DAIKI Graduate School of Energy Science Assistant Professor,KUSAKA EISHI Graduate School of Energy Science Assistant Professor,CHIN YUUSEI Graduate School of Engineering Assistant Professor,YOSHIMITSU NANA

Target year	4th year students or above	Number of credits	2	Year/semesters	2022/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.

B(2)

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.

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.

Course number	U-ENG23 33179 LJ16　　U-ENG23 33179 LJ73		
Course title (and course title in English)	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 Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO
Target year	4th year students or above	**Number of credits** 2	**Year/semesters** 2022/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 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

[Study outside of class (preparation and review)]

Instruction will be given by the professors.

C(3)

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.

Course number	U-ENG23 33180 LJ71　　U-ENG23 33180 LJ75		

Course title (and course title in English)	Materials and Plasticity	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Energy Science Professor,MABUCHI MAMORU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/Second semester
Days and periods	Tue.2	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

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

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

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

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

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

Fundamentals of Dislocation Theory (2); 3 classes; dislocation behavior such as crossing, combination, decomposition, reaction and generation; work hardening from dislocation theory; strengthening mechanism (solid solution strengthening, precipitation strengthening, grain refinement strengthening); thermal activation process and non-thermal activation process of dislocation motion.

(2)

Reports etc. shall be assigned for each item to verify attainment of learning.

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

[Course requirements]

Nothing in particular

[Evaluation methods and policy]

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

[Textbooks]

Additional handouts will be distributed as necessary.

[References, etc.]

Reference books

Fusahito Yoshida,   (Kyoritsu Publishing, 1997), The Japan Society for Technology of Plasticity, ed.,   (Morikita Publishing, 2009), Professor Moriya Oyane,   (Yokendo) ISBN:4842501138

[Study outside of class (preparation and review)]

Instructions are given in class.

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23181 LJ73

Course title (and course title in English)	Design for Infrastructure I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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.

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

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

Planning and Management,3times,Civil Engineering is introduced in the view point of designing and

(2)

managing social Infrastructure, which includes an asset management of social infrastructure, soft measures for traffic jam, logistic vehicles in urban area, etc.
Achievement confirmation,1time,Achievement of learning is confirmed.

[Course requirements]

No specific prior knowledge is required

[Evaluation methods and policy]

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

[Textbooks]

Handouts will be distributed as appropriate.

[References, etc.]

Reference books

[Study outside of class (preparation and review)]

To be notified by instructor during his/her lecture.

Other information (office hours, etc.)

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

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

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

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

Course number	U-ENG23 33182 LJ73		

Course title (and course title in English)	Design for Infrastructure II	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,KITANE YASUO Graduate School of Engineering Associate Professor,ONDA SHINICHIROU

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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

(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

Course number	U-ENG23 33184 PJ73

Course title (and course title in English)	(H27　　　　　　) Surveying and Field Practice	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Professor,SUSAKI JUNICHI Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI Disaster Prevention Research Institute Associate Professor,HIROI KEI Graduate School of Engineering Associate Professor,KAWABATA YUICHIRO Graduate School of Engineering Assistant Professor,KIMURA YUUSUKE Graduate School of Global Environmental Studies Assistant Professor,KOTANI HITOMU Graduate School of Engineering Assistant Professor,TANAKA KOSUKE

Target year	3rd year students or above	Number of credits	3	Year/semesters	2022/First semester

Days and periods	Fri.2,3,4	Class style	Practical training	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

　　　　,1　,

　　　　　,3　,
　　　　　　(　　　　　)
　　　,8　,

　　,3　,

　　　　,4　,

　　,2　,

(H27   )(2)

,3   ,

,4   ,

,2   ,

GPS   ,3   ,GPS   GPS

,1   ,

[Course requirements]

[Evaluation methods and policy]

[Textbooks]

ISBN:9784621087480

[References, etc.]

Reference books

[Study outside of class (preparation and review)]

6   7

Other information (office hours, etc.)

This course is provided in Japanese.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23185 SJ48				

Course title (and course title in English)	Scientific English	T1	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill	
Target year	2nd year students or above	**Number of credits**	1	**Year/semesters**	2022/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.

Course number	U-ENG23 23185 SJ48

Course title (and course title in English)	T1 Scientific English		Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

Course number	U-ENG23 23185 SJ48		

Course title (and course title in English)	T1 Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

Course number	U-ENG23 23185 SJ48

Course title (and course title in English)	Scientific English	T2	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	Scientific English / T2	**Instructor's name, job title, and department of affiliation**	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Karin L. Swanson

Target year	2nd year students or above	**Number of credits**	1	**Year/semesters**	2022/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.

Course number	U-ENG23 23185 SJ48		

Course title (and course title in English)	Scientific English	T2	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Karin L. Swanson

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

Course number	U-ENG23 23185 SJ48		

Course title (and course title in English)	T3 Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

Course number	U-ENG23 23185 SJ48		

Course title (and course title in English)	T3 Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

Course number	U-ENG23 23185 SJ48		

Course title (and course title in English)	T3 Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Karin L. Swanson

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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 23185 SJ48		

Course title (and course title in English)	T4 Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Karin L. Swanson

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

Course number	U-ENG23 23185 SJ48				
Course title (and course title in English)	T4 Scientific English		**Instructor's name, job title, and department of affiliation**	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill	
Target year	2nd year students or above	**Number of credits**	1	**Year/semesters**	2022/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 23185 SJ48		

Course title (and course title in English)	Scientific English	T4	Instructor's name, job title, and department of affiliation	Graduate School of Management Associate Professor,OOBA TETSUHARU Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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.

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

Course title (and course title in English)	Resource information analysis	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 Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA

Target year	4th year students or above	Number of credits	2	Year/semesters	2022/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.

(2)

- -

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

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

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

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

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

Others; prints will be distributed as appropriate.

[References, etc.]

Reference books

Introduced during class

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

In case of questions, students should come to the office of the professor in charge. After the grade evaluation, a class for feedback on the content that was insufficiently understood will be conducted.

(3)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33190 LJ77 U-ENG23 33190 LJ75		

Course title (and course title in English)	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	2022/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 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 crystalline and crack-containing materials' elastic deformation and strength.

[Course schedule and contents]

1st: Explanation about the contents, schedule and evaluation etc.
 Introduction: "Mechanical properties of materials; deformation and destruction", "Industry and materials testing",
 "Accident caused by material destruction", "Physics of deformation and destruction", "Materials science for Earth Resources Engineering"
2nd: Stress/strain and elasticity (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 a 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)

(2)

14th: Rheology model (Macro rheology model, Microrheology model)
15th: 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 report problem is given in every class. The grade is evaluated by the sum of their scores and the midterm and final exams. The grading weights of them are 30% and 70%, respectively.

[Textbooks]

Not used
Not specified

[References, etc.]

Reference books

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

Related URLs

(This course does not have a web site.)

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33200 LJ71　U-ENG23 33200 LJ77

Course title (and course title in English)	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	2022/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 described.

[Course objectives]

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

[Course schedule and contents]

1st: Explanation about the contents, schedule and evaluation etc.
 Outline of class and explanation of syllabus, History of elasticity, Stress,
 Coordinate transformation of stress, Principal stress
2nd: Maximum shear stress, Mohl s stress circle, Invariant of stress
3rd: Displacement and strain, Coordinate transformation of strain, Invariant of strain, Mohl 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

(2)

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

Not used
Not specified.

[References, etc.]

Reference books

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

Related URLs

(This course does not have a web site. But some lecture documents may be deribered by the net. The URL to download the lecture documents will be announced in the class.)

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33210 SJ77　U-ENG23 33210 SJ54

Course title (and course title in English)	Numerical Methods for Engineering and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Engineering Professor,FUKUYAMA EIICHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/Second semester

Days and periods	Mon.1,2	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

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

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

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

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

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

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

[Course requirements]

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

(2)

[Evaluation methods and policy]

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

[Textbooks]

Additional handouts will be distributed as necessary.

[References, etc.]

Reference books
Will be introduced during classes, if necessary.

[Study outside of class (preparation and review)]

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

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

Other information (office hours, etc.)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33220 EJ77		
Course title (and course title in English)	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,TAKEKAWA JUNICHI 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 Assistant Professor,YOSHIMITSU NANA

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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]

[Textbooks]

(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.

Course number	U-ENG23 33231 EJ77 U-ENG23 33231 EJ73 U-ENG23 33231 EJ58

Course title (and course title in English)	Geological and Geophysical Survey, Field Excursion	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Associate Professor,KASHIWAYA KOUKI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,ISHITSUKA KAZUYA Graduate School of Engineering Assistant Professor,KUBO DAIKI Graduate School of Engineering Assistant Professor,XU Shibo Graduate School of Energy Science Assistant Professor,CHIN YUUSEI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

(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.

Course number	U-ENG23 33240 LJ58　　U-ENG23 33240 LJ77　　U-ENG23 33240 LJ73		
Course title (and course title in English)	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**	2022/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

(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.

Course number	U-ENG23 23250 LJ58　U-ENG23 23250 LJ77　U-ENG23 23250 LJ73		

Course title (and course title in English)	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	2022/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 synthetic research areas being covered in this academic domain.

[Course schedule and contents]

General introduction to earth resources problems (1 class) The discussion is on how the earth resources engineering has developed after the industrial revolution chronologically with a special interest in relations with earth sciences such as geology, geophysics, and many other engineering fields.

Resources geology (4 classes) Fundamentals of resource geology about generation mechanism and location of deposits in the earth and accumulation mechanism of useful metals such as metals are accumulated. First topics are fundamentals of geoscience, including the physical and chemical structures of the earth, geologic and tectonic histories, physics, and chemistry of mineralogy and ores. Next, by classifying deposits by origins into igneous (ortho-magmatic and hydrothermal), sedimentary (chemical deposition, weathering, etc.), and metamorphic deposits, characteristics and generation mechanisms of each deposit type are explained, as wells as a brief introduction of hydrocarbon and coal deposits, typical fossil energy resources. To deepen interests, typical ores in Japanese mines are exhibited. Furthermore, as fundamental knowledge of resource use, basics of geochemical exploration, regional exploration technique using remote sensing, and assessment of reserves using geostatistics and the recent global trend of resource exploration are outlined.

Exploration Geophysics (3 classes) Exploration geophysics for the development of hydrocarbon, metallic and mineral deposits are outlined. Fundamentals on exploration seismology, exploration electromagnetics, petrophysics and related fields are covered. The future direction of exploration methodologies is discussed, too.

Rock Mechanics (3 classes) Information and knowledge of the mechanics of rock are essential to ensure the safety of various engineering projects, such as mining engineering, radioactive waste disposal, and carbon capture and storage. To understand the mechanics of rock, the mechanical properties (the deformation, fracturing, and strength) of rock are described. In addition, the influences of the environmental conditions (e. g., temperature, humidity, and water) on the mechanical properties are described.

Petroleum Engineering (3 classes) An overview of oil and natural gas development technology will be introduced, and then the drilling technology, reservoir evaluation technology and production technology for

oil and natural gas are explained. The environmental measures technologies such as CCS (Carbon Capture and Storage) and CCUS (Carbon Capture Utilization and Storage) are also explained.
Confirmation of proficiency level (1 class) The proficiency level throughout the classes is confirmed for students to deepen their understanding. The answers to the questions used to check the proficiency will be provided.

[Course requirements]

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-ENG23 33260 LJ77

Course title (and course title in English)	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	2022/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 the geothermal reservoir is explained. Then, the reservoir properties relating to the flow, such as porosity, permeability, relative permeability, capillary pressure, and so on, are explained. Reservoir fluids' properties and their phase behavior are also explained. Furthermore, drilling and completion for an oil/gas well, log interpretation method, and well test analysis are presented.

[Course objectives]

The course goals are as follows: 1) to understand the basics of fluid flow in reservoir based on Darcy#039s law, 2) to master the properties of reservoir rock and fluids and their evaluation methods, 3) to obtain basic knowledge about oil/gas well drilling and completion methods, 4) to understand the log interpretation method and well test analysis.

[Course schedule and contents]

1st: Introduction (Explanation about class schedule and grade evaluation), Summary of oil field development, Reserves and reserve evaluation methods
 2nd: 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 a reservoir
13th: Basic theory of well test analysis
14th: Exercise of well test analysis
15th: Feedback (Review of this class and examination)

[Course requirements]

The knowledge of differential calculus, integral calculus, physical chemistry and exploration geophysics are necessary for this course.

(2)

[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

Course number	U-ENG23 33270 LJ73　U-ENG23 33270 LJ24		

Course title (and course title in English)	Social Engineering for Disaster Reduction	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies 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 Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO

Target year	4th year students or above	Number of credits	2	Year/semesters	2022/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 so that students can propose reasonable policies for disaster risk reduction in reality. To comprehensively understand various concepts, scientific methodologies, engineering technologies and plannings related to social policies for reducing the damage due to natural disasters.

[Course schedule and contents]

(1) Basics and overviews of social engineering for disaster reduction [4 weeks]
Features and variety of natural disasters, damages due to various kinds of disaster, Conceptual framework of disaster risk reduction

(2) Disaster prevention planning [3-4 weeks]
Based on specified hazard events such as earthquake, floods and so on, the process of disaster events and disaster prevention planning regarding engineering and social measures is provided.

(3) Disaster and information [3-4 weeks]
During a disaster event, various emergency measures must be undertaken including evacuation. The role of information in disaster and measures to link the information to action is discussed.

(4) Evaluation of disaster risk [3-4 weeks]

(5) Feedback

(2)

[Course requirements]

None

[Evaluation methods and policy]

The score is based on the evaluation of multiple report works including mini-reports after the classes.

[Textbooks]

Hand-out materials will be distributed.

[References, etc.]

Reference books

[Study outside of class (preparation and review)]

Homework such as writing essays will be given as needed-basis.

Other information (office hours, etc.)

Office hour is not specified, but students may ask lectures questions by email.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

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

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

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

Course number	U-ENG23 33280 LJ14　　U-ENG23 33280 LJ58　　U-ENG23 33280 LJ77

Course title (and course title in English)	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 Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,XU　Shibo

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/First semester

Days and periods	Tue.4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

About various subsurface exploration methods, technologies for investigating subsurface natural resources from the surface of the earth, their exploration principles, as well as data acquisition methods will be introduced.
Along with lectures on basic physicochemical principles of data processing technology and interpretation methods, energy
-The application to the resource field, environment field, disaster prevention field, ground engineering field, and civil engineering field will also be introduced.

[Course objectives]

The goal is to understand geophysical exploration methods from the perspectives of electromagnetics, seismology, geochemistry, and rock physics.

[Course schedule and contents]

Geoelectromagnetism and geophysical exploration, 5 times, outlines the basic theory of exploration technology by geoelectromagnetic methods. Geophysical exploration
Learn the physical basis and measured physical quantities of geoelectromagnetic methods used in the field of
By doing so, the goal is to understand its physical significance.
Seismology and geophysical exploration, 6 times, outline the basic theory of exploration technology by seismological methods. Refraction from the basics of seismology
By learning about measured physical quantities from the physical basis of law and reflection method exploration,
The goal is to understand the scientific significance.
Geochemical exploration and remote sensing, 3 times, chemical properties of rock minerals forming the crust, mantle, and core,
And a geochemical overview of the basics of geochemical measurements used in the exploration of metal deposits and energy resources.
After that, the interaction between electromagnetic waves and substances used in remote sensing technology, optical sensors, and synthetic apertures.
Basics such as data, remote sensing image processing method and topographic analysis, resource exploration, environmental monitoring, etc.
The application to the above will be described.
Confirmation of achievement, 1 time, understanding of lecture contents.

(2)

[Course requirements]

Preferrable students are those who have taken university-level physics, chemistry, and earth science.

[Evaluation methods and policy]

Basically, a paper-based exam will be conducted, but each professor in charge may explain the method of grade evaluation.

[Textbooks]

Instructed during class

[References, etc.]

Reference books

Introduced during class

[Study outside of class (preparation and review)]

N.P.

Other information (office hours, etc.)

Anytime.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

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

(2) Details of instructors' practical work experience related to the course
Mikada: Schlumberger 10 yrs, JAMSTEC 5.5 yrs.
Takekawa: Geo-Research Inst. 2.3 yrs.

(3) Details of practical classes delivered based on instructors' practical work experience
Lecture on praxis of geophysical exploration used in private sector practice.

Course number	U-ENG23 33290 SJ14 U-ENG23 33290 SJ15		
Course title (and course title in English)	Data Analysis in Environmental Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies 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 Associate Professor,YANO JUNYA
Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/Second semester
Days and periods	Fri.4,5	Class style	Seminar	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

1
2   R
3

4

5

6   SVM   NN
7
8

9
10
11
12
13
14
15

(2)

[Course requirements]

None

[Evaluation methods and policy]

50 20% 30

[Textbooks]

Instructed during class

[References, etc.]

Reference books
Introduced during class

[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 23291 LJ73

Course title (and course title in English)	I Hydraulics I and Exercises		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Engineering Associate Professor,HARADA EIJI Graduate School of Engineering Assistant Professor,Yuma Shimizu

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/Second semester

Days and periods	Wed.3,4	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Hydrodynamics corresponding to fundamental design of hydraulic structures is explained systematically in connection with classical fluid dynamics. Specifically, elementary fluid dynamics, dynamics of perfect fluid, viscous flow and turbulence, dimensional analysis, and one-dimensional flow equation and steady flow in pipelines and open channels. Steady flow related to pipe flow and open channel are main topics. Students will deepen their understanding of the basic theory through exercises.

[Course objectives]

Systematic understanding of fundamental hydraulics   fluid mechanics through exercises

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time, Exercises(Ex): 90 minutes: 0.5 times>.
Vector and tensor analysis [Ex:1time]
Elementary Fluid Dynamics [Lec:6times, Ex:1time]: What is a continuum, Eulerian and Lagrangean descriptions, continuity equation, Euler's equation of motion, Bernoulli's theorem, two-dimensional irrotational flow, etc. are explained. In the exercises, one-dimensional analytical methods based on the continuity equation and the equation of motion are considered.
Viscous Flow and Turbulence (Lec:4times): Deformation stress, Navier Stokes equation, velocity distribution and friction loss in laminar flow, laminar and turbulent flow, Reynolds stress and Reynolds equation in turbulent flow, velocity distribution in turbulent flow will be explained.
Intermediate examination: Intermediate examination is carried out.
One-dimensional flow equations [Lec:2times]: The derivation of energy and momentum equations for onedimensional
flows from Reynolds equations will be discussed in detail, and resistance laws for turbulent
flows in one-dimensional flows will be described.
Dimensional analysis and similarity law [Ex:0.5times]: Explanation and exercises on hydraulic quantities and dimensional analysis, pi-theorem and similarity law.
Steady flow in pipe [Ex:0.5times]: Simple calculations of siphons and conduits (single, parallel and pipe networks) are presented.
Steady-state flow in open channels [Lec:4times, Lec:2times]: The derivation of the water-surface equation from the energy and momentum equations for one-dimensional flows is discussed in detail. Specific energy, specific force, expressions for isentropic flow velocity, isentropic and limiting water depths, water surface profile equations for gradual flow and their qualitative solutions (qualitative sketch of water surface profiles)

are explained. In the exercises, basic problems of open channel analysis based on one-dimensional flow equations will be dealt with.
Achievement confirmation: Comprehension assessment will be conducted.
Feedback

[Course requirements]

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

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exams (50 marks for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

ISBN:978-4-627-67671-8

[References, etc.]

Reference books

[Study outside of class (preparation and review)]

Review of lecture content and revision of exercises

Other information (office hours, etc.)

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33292 LJ73

Course title (and course title in English)	II Hydraulics II	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Engineering Associate Professor,HARADA EIJI

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/First semester

Days and periods	Tue.4	**Class style**	Lecture	**Language of instruction**	Japanese

[Overview and purpose of the course]

As a continuation to Hydraulics I and the Exercises, the essential topics in modern hydraulics and fluid mechanics are covered and discussed in detail. In particular, the mechanics of water surface waves, the shallow water flow equation and its applications, turbulence statistics and the closure problem of Reynolds equation are addressed.

[Course objectives]

To learn and deepen the understanding of essential matters in modern hydraulics   fluid mechanics.

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time>.
Dynamics of water surface waves [Lec:4times]: Governing equations of water surface waves, solutions of small amplitude waves, long and deep water waves, wave groups and group velocities, mechanical energy of water surface waves, surface tension waves, two-dimensional waves.
Shallow water flow equation [Lec:2times]: Depth integration and derivation of shallow water flow equation, shallow water flow equation for rotating systems.
Intermediate examination: Intermediate examination is carried out.
Equation of coastal current [Lec:2times]: Derivation of the equation of coastal current and explanation of the physical meaning of radiation stress.
Turbulence statistics and Reynolds equation completion problem [Lec:5times]: Turbulence statistics, Kolmogorov's local isotropy theory, derivation of Reynolds stress equation, Boussinesq approximation and one and two equation turbulence models.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

[Course requirements]

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

II(2)

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exam (50 marks for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

ISBN:978-4-627-67671-8

[References, etc.]

Reference books

[Study outside of class (preparation and review)]

Review of lecture content

Other information (office hours, etc.)

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33293 LJ73

Course title (and course title in English)	River/Coastal Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Disaster Prevention Research Institute Professor,SUMI TETSUYA Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,HARADA EIJI Disaster Prevention Research Institute Associate Professor,TAKEMON YASUHIRO Graduate School of Engineering Assistant Professor,IKARI HIROYUKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/Second semester

Days and periods	Wed.1	Class style	Lecture	Language of instruction	Japanese

[Overview and purpose of the course]

Fundamental items related to river engineering (i.e. mathematics of flood flow, characteristics of flood disasters, flood control, river basin planning, nature restoration, and sediment transport management) and coastal engineering (i.e., coastal processes, wave shoaling, irregular wave, tsunami, storm surge, tidal wave, wave force) and basics of sediment-transport related to both river/coastal engineering are taught.

[Course objectives]

Our goal is a systematic understanding of fundamental aspects of river/coastal engineering.

[Course schedule and contents]

<Lectures(Lec): 90 minutes >.
Flood Control Planning [Lec:4times]: Rivers and river engineering (why river engineering is important, history of human involvement in rivers, characteristics of recent floods), flood flow hydraulics (building bridge from hydraulics to river engineering), inundation analysis (hazard map), river topography (riverbed morphology) and river channel shape (ruler cross-section, embankment), river law and flood control planning (river maintenance basic policy and river improvement plan), and river structures (dams, weirs, sluices and gates) are outlined.
River Environment Planning [Lec:2times]: Ecosystem services and river ecosystem management, nature oriented river works, environmental improvement below dams, integrated sediment management (erosion control, reservoir sedimentation/sediment removal, river channel management), and integrated basin management (River Basin Disaster Resilience and Sustainability by All, Eco-DRR) are outlined.
Movable bed hydrodynamics [Lec:2times]: Outlines of River bed fluctuation and beach deformation analysis, and basics of bed and suspended load models are outlined.
Wave statistics and wave deformation [Lec:2times]: Mechanism of wave generation and development and engineering treatment of irregular waves are outlined. Transformation mechanisms of ocean waves near the coast due to water depth variation are outlined.
Wave force and wave resistant design [Lec:2times]: The characteristics of waves acting on coastal structures, the formula for calculating the wave force and the stability of rubble mound breakwaters are outlined. An overview of numerical design of wave resistant structures is given, and the latest numerical simulation models are also discussed.
Tsunami and storm surge[Lec:2times]: The characteristics of tsunamis and storm surges are outlined.

(2)

Evacuation behavior and plans for tsunami evacuation are also outlined.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

[Course requirements]

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

[Evaluation methods and policy]

Grades will be based on an assessment of the final exam.

[Textbooks]

[References, etc.]

Reference books

2004   ISBN:978-4-627-49561-6

2019   ISBN:978-4-7973-9708-6

[Study outside of class (preparation and review)]

Review of lecture content

Other information (office hours, etc.)

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lecture is conducted along with exercise. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33294 EJ73		
Course title (and course title in English)	(R2) Experiments on Hydraulics(Enrolled after 2020)	**Instructor's name, job title, and department of affiliation**	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,KAWAIKE KENJI Disaster Prevention Research Institute Professor,MORI NOBUHITO Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,SANJIYOU MICHIO Graduate School of Engineering Associate Professor,HARADA EIJI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,SHIMURA TOMOYA Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI 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 Engineering Assistant Professor,TANAKA TOMOHIRO Academic Center for Computing and Media Studies Assistant Professor,TORIU 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**	2022/Second semester
Days and periods	Thu.3,4	**Class style**	Experiment	**Language of instruction**	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

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

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

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

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

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

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

Hydraulic experiment instruction manual (distributed on KULASIS)

[References, etc.]

Reference books

　　　　　　　　　　(　　　　, 2022)　　ISBN:978-4-627-67671-8

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13501 LE14 U-ENG23 13501 LE73		

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 Associate Professor,KHAYYER ABBAS Graduate School of Engineering KANKEI KYOIN

Target year	1st year students or above	Number of credits	2	Year/semesters	2022/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

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.

Course number	U-ENG23 13502 SE73		

Course title (and course title in English)	Exercises in Infrastructure Design Exercises in Infrastructure Design	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering KANKEI KYOIN

Target year	1st year students or above	**Number of credits**	2	**Year/semesters**	2022/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

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.

Course number	U-ENG23 13503 SE73

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	2022/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%).

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.

Course number	U-ENG23 23504 LE57

Course title (and course title in English)	Fundamental Mechanics Fundamental Mechanics		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,AN RIN

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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 formulaeparticle dynamics in a non-framemotion relative to the Earthmulti-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 cablesequilibrium of solid beamsangular momentum of a rigid bodyinerital 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.

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.

Course number	U-ENG23 23505 LE55		

Course title (and course title in English)	Prob. & Statistical Analysis & Exercises Probabilistic and Statistical Analysis and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KIM SUNMIN

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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.

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.

Course number	U-ENG23 23506 LE73

Course title (and course title in English)	Design for Infrastructure I Design for Infrastructure I		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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.

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.

Course number	U-ENG23 23507 LE73

Course title (and course title in English)	Systems Analysis & Exe. for Plan. & Mng. Systems Analysis and Exercises for Planning and Management	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Associate Professor,SCHMOECKER Jan-Dirk

Target year	2nd year students or above	**Number of credits**	2	**Year/semesters**	2022/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.

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.

Course number	U-ENG23 23508 LE73		

Course title (and course title in English)	Soil Mechanics I and Exercises Soil Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	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 Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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

Soil Mechanics I and Exercises(2)

- -

Class feedback, 1 time, Confirmation of understanding

[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 23510 LE55

Course title (and course title in English)	Engineering Mathematics B1 Engineering Mathematics B1		**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Associate Professor,QURESHI　Ali Gul

Target year	2nd year students or above	**Number of credits**	2	**Year/semesters**	2022/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.

Course number	U-ENG23 23511 LE73		

Course title (and course title in English)	Structural Mechanics I and Exercises Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,KIM Chul-Woo Graduate School of Engineering Associate Professor,AN RIN Graduate School of Engineering Senior Lecturer,Chang, Kai-Chun

Target year	2nd year students or above	Number of credits	2	Year/semesters	2022/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

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.   (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.

Course number	U-ENG23 33512 LE73

Course title (and course title in English)	Dynamics of Soil and Structures Dynamics of Soil and Structures	Instructor's name, job title, and department of affiliation	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	2022/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.

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.

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.

Course number	U-ENG23 33513 LE73		

Course title (and course title in English)	Construction Materials Construction Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,AN RIN

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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.

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

isbn{}{9784254261622}

[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 33514 LE73

Course title (and course title in English)	Structural Mechanics II and Exercises Structural Mechanics II and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year	3rd year students or above	Number of credits	3	Year/semesters	2022/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   and Exercises

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 , Maruzen Ltd. isbn{}{4621046403}(in Japanese)

[Study outside of class (preparation and review)]

Study exercise and assignment repeatedly.

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33515 LE73		
Course title (and course title in English)	Continuum Mechanics Continuum Mechanics	**Instructor's name, job title, and department of affiliation**	Graduate School of Management Professor,HIGO YOUSUKE Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong
Target year	3rd year students or above	**Number of credits** 2	**Year/semesters** 2022/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

[Course requirements]

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

Continuum Mechanics(2)

[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. Higo by e-mail: higo.yohsuke.5z@kyoto-u.ac.jp or office at Katsura C1-235
Assoc. Prof. Thirapong by e-mail: pipatpongsa.thirapong.4s@kyoto-u.ac.jp or office at Katsura C1-236
Assoc. Prof. Shinichiro Onda by e-mail: onda.shinichiro.2e@kyoto-u.ac.jp or office at Katsura C1-266)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33517 LE73		
Course title (and course title in English)	Fundamentals of Hydrology Fundamentals of Hydrology	**Instructor's name, job title, and department of affiliation**	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Disaster Prevention Research Institute Associate Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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.

Fundamentals of Hydrology(2)

- -

Evaporaion and transpiration,3times,The mechanism of water and energy cycle through evapotranspiration is described. Energy balance at land surface and the wind of boundary layer is introduced. Then, methods to measure the evapotranspiration is described.

Flood routing,1time,The mechanism of flood routing is explained. Numerical representation method to represent channel network structure is introduced, then typical flow routing methods are described.

Hydrological model,1time,A physically-based hydrological model which consists of various hydrological processes is described. Typical lumped hydrological models are also introduced.

Society and hydrology,1time,How the hydrological sciences are related to the society is described through various examples.

Achievement confirmation,1time,Quiz, report and the final examination is conducted to measure students#039 knowledge, skill and aptitude on the subject.

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

An English text book is provided, which is compiled based of the text books used in Japanese hydrology class.

[References, etc.]

Reference books

[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 33519 LE73		
Course title (and course title in English)	Soil Mechanics II and Exercises Soil Mechanics II and Exercises	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,KIMURA MAKOTO Graduate School of Management Professor,HIGO YOUSUKE 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,PIPATPONGSA, Thirapong

Target year	3rd year students or above	**Number of credits**	3	**Year/semesters**	2022/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,

Bearing capacity, 1.5 times, Understand the definition of bearing capacity, ultimate bearing capacity, net

Soil Mechanics II and Exercises(2)

- -

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

Other information (office hours, etc.)
Flores (flores.giancarlo.3v@kyoto-u.ac.jp)
 Pipatpongsa (pipatpongsa.thirapong.4s@kyoto-u.ac.jp)

- -

Soil Mechanics II and Exercises(3)

---

*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 33520 EE73

Course title (and course title in English)	Exp on Soil M & Ex Experiments on Soil Mechanics and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Management Professor,HIGO YOUSUKE 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 Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong Disaster Prevention Research Institute Associate Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,KIDO RYUNOSUKE Graduate School of Engineering Assistant Professor,SAWADA MAI Graduate School of Engineering Assistant Professor,MIYAZAKI YUSUKE Graduate School of Global Environmental Studies Assistant Professor,KATO TOMOHIRO Disaster Prevention Research Institute Associate Professor,UEDA KYOHEI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

Exp on Soil M & Ex(2)

- -

Consolidation test, 1 time, Fundamentals of consolidation, laboratory tests, settlement-time relationship

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}

- -

Exp on Soil M & Ex(3)

Dante Fratta et al., ldquoIntroduction to Soil Mechanics Laboratory Testingrdquo, CRC Press isbn{}{9781420045628}

:   isbn{}{9784886440846}

isbn{}{4886440584}

[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

Course number	U-ENG23 33521 LE24 U-ENG23 33521 LE55 U-ENG23 33521 LE73

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	2022/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.

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 introduced 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.

Course number	U-ENG23 33522 LE55 U-ENG23 33522 LE73

Course title (and course title in English)	Engineering Mathematics B2 Engineering Mathematics B2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SCHMOECKER Jan-Dirk

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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)

Engineering Mathematics B2(2)

[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.

Course number	U-ENG23 33524 LE73		

Course title (and course title in English)	Public Economics Public Economics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUSHIMA KAKUYA Disaster Prevention Research Institute Associate Professor,YOKOMATSU MUNETA Graduate School of Global Environmental Studies Assistant Professor,KOTANI HITOMU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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 Comititive 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

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.

Course number	U-ENG23 33526 LE73			

Course title (and course title in English)	Urban and Regional Planning Urban and Regional Planning		**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Associate Professor,QURESHI　Ali Gul

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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,

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 introduced 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.

Course number	U-ENG23 33527 LE73

Course title (and course title in English)	Transportation Management Engineering Transportation Management Engineering	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Associate Professor,SCHMOECKER　Jan-Dirk

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/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}

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.

Course number	U-ENG23 33528 LE73		

Course title (and course title in English)	Geoenvironmental Engineering Geoenviornmental Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KATSUMI TAKESHI 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	2022/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}

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
8.5

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

Course number	U-ENG23 33529 LE77　　U-ENG23 33529 LE73

Course title (and course title in English)	Rock Engineering Rock Engineering		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Engineering Associate Professor,PIPATPONGSA, Thirapong

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

Rock Engineering(2)

[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.

Course number	U-ENG23 33530 LE73

Course title (and course title in English)	Design for Infrastructure II Design for Infrastructure II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,ONDA SHINICHIROU
Target year	3rd year students or above	**Number of credits** 2	**Year/semesters** 2022/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.

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

Course number	U-ENG23 33531 LE73		
Course title (and course title in English)	Water Resources Engineering Water Resources Engineering	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,HORI TOMOHARU Graduate School of Engineering Associate Professor,KIM SUNMIN
Target year	3rd year students or above	**Number of credits** 2	**Year/semesters** 2022/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

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.

Course number	U-ENG23 33534 PE73

Course title (and course title in English)	International Internship International Internship	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KITANE YASUO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

International Internship(2)

[Courses delivered by instructors with practical work experience]

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

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

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

Course number	U-ENG23 33535 LE73			

Course title (and course title in English)	E & WR of S, & RSDP Earthquake and Wind Resistance of Structures, and Related Structural Design Principles	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute 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	2022/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

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.

Course number	U-ENG23 33536 LE73

Course title (and course title in English)	Concrete Engineering Concrete Engineering		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,AN RIN

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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.

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.

Course number	U-ENG23 33537 EE73

| Course title (and course title in English) | CP & Exp on Struct M
 Computer Programming and Experiment on Structural Mechanics | Instructor's name, job title, and department of affiliation | Graduate School of Engineering Professor,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,UEMURA KEITA
 Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI |

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/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

CP & Exp on Struct M(2)

- -

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

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

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

[Course requirements]

CompuTer Programming in Global Engineering, Structure mechanics   and Exercises, Structure mechanics 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.

Course number	U-ENG23 43538 GE73 U-ENG23 43538 GE14

Course title (and course title in English)	Graduation Research Graduation Research		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Associate Professor,ONDA SHINICHIROU

Target year	4th year students or above	Number of credits	5	Year/semesters	2022/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

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.

Course number	U-ENG23 23540 LE73		

Course title (and course title in English)	Hydraulics I and Exercises Hydraulics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,KHAYYER ABBAS 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	2022/Second semester

Days and periods	Wed.3,4	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Hydrodynamics corresponding to fundamental design of hydraulic structures is explained systematically in connection with classical fluid dynamics. Specifically, elementary fluid dynamics, dynamics of perfect fluid, viscous flow and turbulence, dimensional analysis, and one-dimensional flow equation and steady flow in pipelines and open channels. Steady flow related to pipe flow and open channel are main topics. Students will deepen their understanding of the basic theory through exercises.

[Course objectives]

Systematic understanding of fundamental hydraulics fluid mechanics through exercises

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time, Exercises(Ex): 90 minutes: 0.5 times>.
Vector and tensor analysis [Ex:1time]
Elementary Fluid Dynamics [Lec:6times, Ex:1time]: What is a continuum, Eulerian and Lagrangean descriptions, continuity equation, Euler's equation of motion, Bernoulli's theorem, two-dimensional irrotational flow, etc. are explained. In the exercises, one-dimensional analytical methods based on the continuity equation and the equation of motion are considered.
Viscous Flow and Turbulence (Lec:4times): Deformation stress, Navier Stokes equation, velocity distribution and friction loss in laminar flow, laminar and turbulent flow, Reynolds stress and Reynolds equation in turbulent flow, velocity distribution in turbulent flow will be explained.
Intermediate examination: Intermediate examination is carried out.
One-dimensional flow equations [Lec:2times]: The derivation of energy and momentum equations for onedimensional
flows from Reynolds equations will be discussed in detail, and resistance laws for turbulent
flows in one-dimensional flows will be described.
Dimensional analysis and similarity law [Ex:0.5times]: Explanation and exercises on hydraulic quantities and dimensional analysis, pi-theorem and similarity law.
Steady flow in pipe [Ex:0.5times]: Simple calculations of siphons and conduits (single, parallel and pipe networks) are presented.
Steady-state flow in open channels [Lec:4times, Ex:2times]: The derivation of the water-surface equation from the energy and momentum equations for one-dimensional flows is discussed in detail. Specific energy, specific force, expressions for isentropic flow velocity, isentropic and limiting water depths, water surface profile equations for gradual flow and their qualitative solutions (qualitative sketch of water surface profiles) are explained. In the exercises, basic problems of open channel analysis based on one-dimensional flow equations will be dealt with.

Hydraulics I and Exercises(2)

Achievement confirmation: Comprehension assessment will be conducted.
Feedback

[Course requirements]

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

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exams (50 marks
for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

Printed materials will be distributed as necessary for the exercises.

[References, etc.]

Reference books
non

[Study outside of class (preparation and review)]

Review of lecture content and revision of exercises

Other information (office hours, etc.)

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such
as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture
and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33541 LE73		
Course title (and course title in English)	Hydraulics II Hydraulics II	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,HARADA EIJI Graduate School of Engineering Assistant Professor,IKARI HIROYUKI

Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2022/First semester

Days and periods	Tue.4	**Class style**	Lecture	**Language of instruction**	English

[Overview and purpose of the course]

As a continuation to Hydraulics I and the Exercises, the essential topics in modern hydraulics and fluid mechanics are covered and discussed in detail. In particular, the mechanics of water surface waves, the shallow water flow equation and its applications, turbulence statistics and the closure problem of Reynolds equation are addressed.

[Course objectives]

To learn and deepen the understanding of essential matters in modern hydraulics　fluid mechanics.

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time>.
Dynamics of water surface waves [Lec:4times]: Governing equations of water surface waves, solutions of small amplitude waves, long and deep water waves, wave groups and group velocities, mechanical energy of water surface waves, surface tension waves, two-dimensional waves.
Shallow water flow equation [Lec:2times]: Depth integration and derivation of shallow water flow equation, shallow water flow equation for rotating systems.
Intermediate examination: Intermediate examination is carried out.
Equation of coastal current [Lec:2times]: Derivation of the equation of coastal current and explanation of the physical meaning of radiation stress.
Turbulence statistics and Reynolds equation completion problem [Lec:5times]: Turbulence statistics, Kolmogorov's local isotropy theory, derivation of Reynolds stress equation, Boussinesq approximation and one and two equation turbulence models.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

Hydraulics II(2)

[Course requirements]

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

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exam (50 marks for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

non

[References, etc.]

Reference books

non

[Study outside of class (preparation and review)]

Review of lecture content

Other information (office hours, etc.)

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33542 LE73		

Course title (and course title in English)	River/Coastal Engineering River/Coastal Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Disaster Prevention Research Institute Professor,SUMI TETSUYA Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,KHAYYER ABBAS Disaster Prevention Research Institute Associate Professor,TAKEMON YASUHIRO Graduate School of Engineering Assistant Professor,Yuma Shimizu

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/Second semester
Days and periods	Wed.2	Class style	Lecture	Language of instruction	English

[Overview and purpose of the course]

Fundamental items related to river engineering (i.e. mathematics of flood flow, characteristics of flood disasters, flood control, river basin planning, nature restoration, and sediment transport management) and coastal engineering (i.e., coastal processes, wave shoaling, irregular wave, tsunami, storm surge, tidal wave, wave force) and basics of sediment-transport related to both river/coastal engineering are taught.

[Course objectives]

Our goal is a systematic understanding of fundamental aspects of river/coastal engineering.

[Course schedule and contents]

<Lectures(Lec): 90 minutes >.
Flood Control Planning [Lec:4times]: Rivers and river engineering (why river engineering is important, history of human involvement in rivers, characteristics of recent floods), flood flow hydraulics (building bridge from hydraulics to river engineering), inundation analysis (hazard map), river topography (riverbed morphology) and river channel shape (ruler cross-section, embankment), river law and flood control planning (river maintenance basic policy and river improvement plan), and river structures (dams, weirs, sluices and gates) are outlined.
River Environment Planning [Lec:2times]: Ecosystem services and river ecosystem management, nature oriented river works, environmental improvement below dams, integrated sediment management (erosion control, reservoir sedimentation/sediment removal, river channel management), and integrated basin management (River Basin Disaster Resilience and Sustainability by All, Eco-DRR) are outlined.
Movable bed hydrodynamics [Lec:2times]: Outlines of River bed fluctuation and beach deformation analysis, and basics of bed and suspended load models are outlined.
Wave statistics and wave deformation [Lec:2times]: Mechanism of wave generation and development and engineering treatment of irregular waves are outlined. Transformation mechanisms of ocean waves near the coast due to water depth variation are outlined.
Wave force and wave resistant design [Lec:2times]: The characteristics of waves acting on coastal structures, the formula for calculating the wave force and the stability of rubble mound breakwaters are outlined. An overview of numerical design of wave resistant structures is given, and the latest numerical simulation models are also discussed.
Tsunami and storm surge[Lec:2times]: The characteristics of tsunamis and storm surges are outlined.

River/Coastal Engineering(2)

Evacuation behavior and plans for tsunami evacuation are also outlined.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

[Course requirements]

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

[Evaluation methods and policy]

Grades will be based on an assessment of the final exam.

[Textbooks]

non

[References, etc.]

Reference books

non

[Study outside of class (preparation and review)]

Review of lecture content

Other information (office hours, etc.)

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lecture is conducted along with exercise. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33543 EE73

| Course title (and course title in English) | Experiments on Hydraulics(Enrolled after 2020)
Experiments on Hydraulics(Enrolled after 2020) | Instructor's name, job title, and department of affiliation | Graduate School of Management
Professor,ICHIKAWA YUTAKA
Graduate School of Engineering
Professor,GOTOH HITOSHI
Graduate School of Engineering
Professor,TACHIKAWA YASUTO
Disaster Prevention Research Institute
Professor,KAWAIKE KENJI
Disaster Prevention Research Institute
Professor,MORI NOBUHITO
Graduate School of Engineering
Associate Professor,ONDA SHINICHIROU
Graduate School of Engineering
Associate Professor,SANJIYOU MICHIO
Graduate School of Engineering
Associate Professor,HARADA EIJI
Disaster Prevention Research Institute
Associate Professor,SAYAMA TAKAHIRO
Disaster Prevention Research Institute
Associate Professor,SHIMURA TOMOYA
Disaster Prevention Research Institute
Associate Professor,YAMAGUCHI KOSEI
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 Engineering
Assistant Professor,TANAKA TOMOHIRO
Academic Center for Computing and Media Studies
Assistant Professor,TORIU 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	2022/Second semester
Days and periods	Thu.3,4	Class style	Experiment	Language of instruction	English

Experiments on Hydraulics(Enrolled after 2020)(2)

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

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

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

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

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

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

Experiments on Hydraulics(Enrolled after 2020)(3)

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

Hydraulic experiment instruction manual (distributed on KULASIS)

[References, etc.]

Reference books

non

[Study outside of class (preparation and review)]

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

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43999 GJ77 U-ENG23 43999 GJ73 U-ENG23 43999 GJ14

Course title (and course title in English)	( ) Graduation Thesis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Associate Professor,ONDA SHINICHIROU

Target year	4th year students or above	Number of credits	5	Year/semesters	2022/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.

(   )(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.

Course number	U-ENG23 43999 GJ77　　U-ENG23 43999 GJ73　　U-ENG23 43999 GJ14			

Course title (and course title in English)	（　　　　　） Graduation Thesis	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI	
Target year	4th year students or above	**Number of credits** 5	**Year/semesters**	2022/Intensive, year-round
Days and periods Intensive		**Class style** Seminar	**Language of instruction**	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

2　　　74

2　10　　　　　　　　　　　　　　　　　　11　20
　　20　30　　　　　　　　　31　55　　　　　　　　　　56　65

66　　　75

75

(　　　　　　　　)(2)

[Course requirements]

[Evaluation methods and policy]

[Textbooks]

Not used

[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 43999 GJ77 U-ENG23 43999 GJ73 U-ENG23 43999 GJ14

Course title (and course title in English)	( ) Graduation Thesis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,Fujiwara Taku Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year	4th year students or above	Number of credits	5	Year/semesters	2022/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.

(   )(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.

Course number	U-ENG20 32402 SE77		

Course title (and course title in English)	Faculty of Engineering International Internship 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HONDA MITSURU

Target year	3rd year students or above	Number of credits	1	Year/semesters	2022/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   epartment 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]

(2)

Reference books

[Study outside of class (preparation and review)]

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

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

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

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

Course number	U-ENG20 32502 SE77		

Course title (and course title in English)	Faculty of Engineering International Internship 2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HONDA MITSURU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2022/Intensive, year-round

Days and periods	Intensive	Class style	Seminar	Language of instruction	Japanese and English

[Overview and purpose of the course]

Acqsution 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   epartment 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]

[References, etc.]

  Reference books

[Study outside of class (preparation and review)]

  Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

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

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

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

Course number	U-ENG20 22403 SJ77

Course title (and course title in English)	I (　　　) Global Leadership Seminar I (Study for methodology in a company)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,hirai yoshikazu Graduate School of Engineering Senior Lecturer,KOMIYAMA YOSUKE Graduate School of Engineering Professor,HONDA MITSURU

Target year	2nd year students or above	Number of credits	1	Year/semesters	2022/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 expansion on the international market invesitigating worldwide leading companies by group work.

[Course schedule and contents]

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

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

Not used

I(   )(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

Course number	U-ENG20 22503 SJ77		

Course title (and course title in English)	Ⅱ( ) Global Leadership Seminar II (Innovation and its commercialization)	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,HONDA MITSURU Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI

Target year	2nd year students or above	**Number of credits**	1	**Year/semesters**	2022/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]

Depending on the situation of COVID-19 pandemic, all lectures will be given online and residential training will be canceled.

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]

Depending on the situation of COVID-19 pandemic, all lectures will be given online and residential training will be canceled.

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.

[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

 *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

Course number	U-ENG20 42105 LJ77		

Course title (and course title in English)	Engineering Ethics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Professor,SOTOWA KENICHIRO Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year	4th year students or above	Number of credits	2	Year/semesters	2022/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]

(4/8) The central topic is what is ethics for engineers and what is significance of studying ethics for engineers.
(4/15) " General research ethics"
Lectures on the concept of writing academic papers with ethics.
(4/22)" Ethical Theories for Engineering Ethics"
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. This Lecture will be conducted online by using zoom.
(5/6) " Engineering Ethics as a Professional Ethics:"
This lecture discusses basic ideas of engineering ethics in comparison with other fields of applied ethics. In particular, it discusses the characteristics of engineering ethics as professional ethics and what engineers as professionals are required to do.
(5/13) " Ethics for Engineers"
Engineers have to go through some ethical issues about research, development, design, manufacturing, and maintenance. In particular, the ethical decisions of engineers need to be considered for society and environment.
(5/20) Press Release is an essential process for introducing the research to our society through various medias. In this lecture, issues related to Press Release will be addressed and discussed with several examples including SNS release. Lecture will be conducted by Zoom.
(5/27) "Ethics in Water Supply."
It is a basic right in a society that a person can receive and use safe water in sufficient quantity. In addition, a person of water supply utility is recognized to be an essential worker. Taking drinking water supply as a topic, ethics required for a water supplier and an engineer is discussed. It is given by Zoom.
(6/3) " Forensic Analysis"
Forensic repots are sometimes requested by the court in order to clarify the charge of incidents. The nylon rope incident, the Wakayama curry poisoning incident, and the pig iron incident are explained as examples. How to write the forensic report is explained in order to avoid the ethical problems. (Zoom&Youtube)
(6/10) " Patents and Ethics (Part 1)"
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.

(6/17)" Patents and Ethics (Part 2)"
Students, equipped with the basic knowledge of patent systems by the previous lecture, will get familier with actual case studies on ethical and legal issues in patents.

(6/24) "Urban Planning and Ethics"
The lecture focuses on the norms regulating the actions of the engineers involved in planning and designing urban areas, as well as on the normative consciousness required to facilitate such planning and design, demonstrating some examples on urban transport planning. This will be given via Zoom.

(7/1) " General research ethics of synthetic chemistry"
Lectures on the concept of writing academic papers and patents of synthetic chemisty with ethics.

(7/8) Architecture has developed by imitating beautiful buildings, but in recent years there has been an increase in the number of cases where copyright disputes have arisen. In addition, the appearance of architecture often causes landscape controversy because of its influence on the surrounding environment. Issues concerning the ethics and sociality of architecture are discussed while introducing overseas lawsuits and design processes.

(7/15) The materials engineer may stand on the side using materials as well as a side supplying materials. Some examples are introduced and, by this lecture, are argued about an ethic found from each situation by materials engineer. Note that this lecture is going to be carried out in ZOOM, but may be changed to the on-demand on account of the speaker.

(7/29) "Engineer ethics in mechanical design"
Engineer ethics is not a passive and passive thinking that issues the action of simply following existing norms, but a more active and creative thinking to decide and design one's own actions. It requires the logical thinking and ethical thinking necessary for engineers. This is explained with past cases in mechanical design.

[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

(3)

[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

Course number	U-ENG20 12108 LJ77		

Course title (and course title in English)	Introduction to Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,TAKATSU HIROSHI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Professor,MATSUNO FUMITOSHI Research Institute for Sustainable Humanosphere Professor,YAMAMOTO MAMORU Graduate School of Engineering Professor,NUMATA KEIJI Graduate School of Informatics Professor,MINATO SHINICHI Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Professor,KANETA TAKASHI

Target year	1st year students or above	Number of credits	1	Year/semesters	2022/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.

(2)

[Course requirements]

None

[Evaluation methods and policy]

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

[Textbooks]

Specify if necessary.

[References, etc.]

    Reference books

Specify if necessary.

[Study outside of class (preparation and review)]

Specify if necessary.

Other information (office hours, etc.)

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43089 LJ74		

Course title (and course title in English)	< > Introduction to Architectural Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAYASHI YASUHIRO Graduate School of Engineering Professor,TAKEWAKI IZURU Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Graduate School of Engineering Professor,KOETAKA YUUJI

Target year	4th year students or above	Number of credits	2	Year/semesters	2022/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

<   >(2)

- -

a building are explained. Then, the foundamental concept of seismic design is explained. Moreover, basic knowledge of the soil and foundations, and wooden structure are also outlined.

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

[Course requirements]

None

[Evaluation methods and policy]

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

[Textbooks]

Not used

[References, etc.]

Reference books

[Study outside of class (preparation and review)]

None

Other information (office hours, etc.)

[Office hours] Will be detailed during class.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

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

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

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