SYLLABUS 2016

[D] Interdisciplinary Engineering Course Program

Kyoto University, Graduate School of Engineering

[D] Interdisciplinary Engineering Course Program

Laboratory of Applied Mechanics

Laboratory of Evolutionarily Sustainable Infrastructure Engineering

Laboratory of Materials Engineering and Chemistry

Laboratory of Engineering for Life Science and Medicine

Laboratory of Interdisciplinary Photonics and Electronics

Laboratory of Human Security Engineering

Laboratory of Design Science

Laboratory of Integrated Medical Engineering

Applied Mechanics

Code   10G047   Course Year   Master 1st   Term   1st term   Class day & Period   Wed 4th

Location   Engineering Science Depts Bldg.-216   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design of Complex Mechanical Systems

Code   10X411   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 3rd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Mechanical Engineering

Code   10K013   Course Year   Master and Doctor Course   Term   2nd term

Class day & Period   Tue 5th and Thu 4th   Location   C3-Lecture Room 5   Credits   2

Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Faculty members from several fields

Course Description   Lectures on recent topics in various fields of mechanical engineering will be given in English. This is mainly for foreing students (MC/DC), but Japanese students are also welcome.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Mechanics	2	Detailed schedule will be annouced later.
Materials	2	
Thermodynamics	2	
Fluid dynamics	2	
Control	2	
Design	2	
Microengineering	2	
Examination/Feedback	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   This class will be given every two years; Not given in 2015.

10K005

Advanced Modern Science and Technology　English lecture
(　　　　)

Code　10K005　Course Year　Master and Doctor Course　Term　　　Class day & Period　Thu 5th　Location　A2-306　Credits　2(Semester system)　Restriction　No Restriction

Lecture Form(s)　Relay Lecture　Language　English

Instructor　　　GL　　　Edu.　　　Center,　　　J.　　　Assoc.　　　Prof.,　　　Ryosuke　　　Matsumoto
Related professors

Course Description　Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. In addition to the understanding of each technology, the attendances learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development. Group discussions will be done for further understanding of the topics of the course.

Grading　Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site. You can find an attachment file, "　　　　　2016　　　　　　　　", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Who shake the dice?	1	Double slit phenomenon known as a prediction inability " quantum mechanics of the mystery (Feynman says)" can be every moment predicted by QED.(A. Tachibana: Dept. of Micro Engineering)
Exploration of Radiation Belts by Space Radio Engineering	1	Radiation belts of energetic particles are formed around magnetized planets such as the Earth, and they have been studied extensively by spacecraft missions and computer simulations for better understanding and utilization of the space plasma environment. We review historical development of space radio engineering and current understanding of radiation belt dynamics.(Y. Omura: Dept. of Electrical Engineering)
Systems Control in Aeronautics and Astronautics	1	Systems control theory is used in several problems in aeronautics and astronautics. This lecture focuses on some of them and further gives an overview of this research based on them.(K. Fujimoto: Dept. of Aeronautics and Astronautics)
Countermeasures of the Contaminated Water at Fukushima Daiichi Nuclear Power Station and that of the Contaminated Soil in Fukushima Area	1	The situation of contaminated water in Fukushima Daiichi Nuclear Power Station and soil contamination in and around Fukushima area and their technological countermeasures taken today will be introduced and discussed.(M. Yoneda: Dept. of Environmental Engineering)
Polymer Synthesis beyond the 21st Century: Precision Polymerizations and Novel Polymeric Materials	1	We are now in the "Polymer Age", where synthetic polymer materials are indispensable in the modern human life: healthy, safe, comfortable, and sustainable. A critical challenge herein is to develop "precision polymerization", polymer-forming reactions that provide polymers of well-defined structures and designed functions. Given these backgrounds, this lecture will overview the following subjects: (a)What polymers are; (b)How to synthesize polymers; (c)How and where polymeric materials work and function; (d)Precision polymer synthesis; and (e)The future of polymeric materials.(M. Sawamoto: Dept. of Polymer Chemistry)
Engineering Approach to Phase Behavior of Fluids Confined in Nanospace	1	Fluids confined in nano-scale pores exhibit peculiar phase behaviors that depends strongly on physico-chemical effects by pore walls and conditions of the bulk phase in equilibrium with the pore fluids, to which the engineering approach must be effective.(M. Miyahara: Dept. of Chemical Engineering)
Elucidation of Principles for the Self-organization of Mesoscale Colloidal Particles	1	The process of so-called the colloid crystal has been pursued to find out the key principles for the structure evolution, employing the Brownian dynamics simulations. Also given in the lecture will be various pattern formations in the convective self-assembly of colloidal suspensions.(M. Miyahara: Dept. of Chemical Engineering)
Architectural Design and Architectural Thinking	1	Architectural design is integration of thinking on architectural events and materials. I would like to discuss this architectural thinking and the method to embody it.(K. Takeyama: Dept. of Architecture and Architectural Engineering)
Genome sequences, what do they say and how can we use them?	1	Owing to the revolutionary advances in DNA sequencing technology, the complete genome sequences of a large number of organisms are now available. Here we will discuss what these genome sequences tell us and how we can use them to further increase our understanding of life.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Vacuum Nanoelectronics Devices in Harsh Environments	1	This lecture reviews the perspective of the modern vacuum electron devices based on miniaturized electron sources fabricated with contemporary semiconductor processes. The performance of the devices is evaluated in view of the device in harsh environments.(Y. Gotoh: Dept. of Electronic Science and Engineering)
Advanced Digital Technology for Analytical Recording of Cultural Heritage Assets	1	(A. Ide: Dept. of Mechanical Engineering and Science)
Protein Structure, Function, and Motion	1	Proteins work by fluctuating and changing their conformations. Protein structures and motions, which are essential for understanding their functions in detail, are introduced in conjunction with the state-of-art methods to analyze them.(K. Sugase: Dept. of Molecular Engineering)
Laser-induced Breakdown Spectroscopy and Its Application to Underwater In-situ Elemental Analysis	1	Development of laser-induced breakdown spectroscopy (LIBS) for in-situ elemental analysis in water, and the application to resource exploration at sea bottom will be explained.(T. Sakka: Dept. of Energy and Hydrocarbon Chemistry)
Micro- and Nano-scale Separations in Analytical Chemistry	1	Micro- and nano-scale high performance separation techniques, including capillary electrophoresis and microchip electrophoresis, will be discussed in terms of both fundamental characteristics and applications.(K. Otsuka: Dept. of Material Chemistry)
Modern Techniques for Material Characterization	1	Overview of modern techniques for material characterization is given with basic principles and practical applications. Impacts on the life of the people of characterization techniques are also included.(J. Matsuo: Dept. of Nuclear Engineering)

Textbook　None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information　Students who take Autumn term should register "Lecture code 10H006".

Applied Numerical Methods

Code   10G001   Course Year   Master Course   Term   1st term   Class day & Period   Mon 1st

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Toshiyuki Tsuchiya,

Course Description   Numerical techniques, such as the finite element method and numerical control method, are indispensable in mechanical engineering. In this lecture, basics of numerical techniques which are required to study advanced methods for graduated students will be explained. The lecture will cover the error evaluation, linear system solution (Ax=b), eigenvalue analysis, interpolation approximation method, solutions of ordinary differential equation and partial differential equation. The programing exercise is included in this lecture.

Grading   Home works (four home works will be assigned) and examination.

Course Goals   Understandings of mathematical theories and programing implementations of the numerical methods.

Course Topics

Theme	Class number of times	Description
Introduction	1	Introduction of this class
		Numerical representations and errors
		Macro programing using spread sheet applications
Numerical Error, Approximation	1	Matrix
		Norms
		Singular value decomposition
Linear simultaneous equation 1	2	Solution of simultaneous linear equations
		direct method, iteration method
Eigenvalue analysis	2	Eigenvalue problems
Interpolation	1.5	Interpolation and its errors
Numerical integra	1.5	Numerical integration methods
Normal differential equation and numerical integral	2	explicit method, implicit method
		initial value problem, boundary value problem
Partial differential equation	3	Differential expression of partial differential
		Diffusion equation, wave equation
		Poisson equation, Laplace equation
Examination	1	Feedback for homework and examination

Textbook   Lecture note will be given.

Textbook(supplemental)   Golub, G. H. and Loan, C. F. V., Matrix Computations, John Hopkins University Press R.D.Richtmyer and K.W.Morton, Difference Methods for Initial-Value Problems, Second Edition, John Wiley & Sons 1967

Prerequisite(s)   Basic mathematics for undergraduates
Basic macro programing

Independent Study Outside of Class   Problems are based on macro on Microsoft Excel or LibreOffice (OpenOffice).

Web Sites   Lecture notes, home works, and other info will be distributed through PandA: https://panda.ecs.kyoto-u.ac.jp

Additional Information   Have a PC with Microsoft Excel with VBA or LibreOffice (https://ja.libreoffice.org/). Apache OpenOffice(http://www.openoffice.org/ja/) wil be also ok.

Solid Mechanics, Adv.

Code   10G003   Course Year   Master Course   Term   1st term   Class day & Period   Thu 1st

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   S. Biwa, M. Nishikawa

Course Description   In Part I, fundamental issues of the finite deformation analysis of solids and structures are introduced, including tensor analysis, kinematics of continua, conservation laws, and various stress/strain measures. In Part II, basic ideas of elastoplastic and viscoplastic theories are lectured to describe nonlinear material properties, and the derivation of inelastic constitutive equations and their application to numerical analyses are also introduced.

Grading   Grading is based on the examination, possibly with considerations of the homework reports.

Course Goals   The goal is to understand the concepts of finite deformation analysis and inelastic constitutive relations, which constitute the basis of computational mechanics simulations for mechanical/structural design.

Course Topics

Theme	Class number of times	Description
Part I. Fundamentals of finite deformation analysis		
I-1. Tensor analysis	2	Tensor as a linear transformation; Tensor algebra; Transformation of tensor components due to change of basis; Eigenvalues of symmetric tensors; Spectral decomposition; Integral theorem
I-2. Kinematics	2	Reference and current configurations; Deformation gradient; Cauchy-Green deformation tensors; Polar decomposition; Strain tensors; Velocity and acceleration; Material time derivative; Deformation-rate tensor and spin tensor
I-3. Conservation laws	2	Conservation of mass; Laws of motion by Euler and Cauchy; Cauchy stress tensor; Equation of motion; Conservation of energy
I-4. Various definitions of stress	2	First and second Piola-Kirchhoff stresses; Alternative expression of equation of motion; Principle of virtual power
Part II. Basis of inelastic analyses		
II-1. Constitutive equations of elastoplastic body	3	Models of plasticity for uniaxial tension; Yield functions for isotropic materials; Work hardening; J2 flow theory; Elastoplastic constitutive equations
II-2. Numerical methods for elastoplastic body 1	2	Incremental virtual work principle; Basis for incremental finite element analyses
II-3. Numerical methods for elastoplastic body 2	2	Application to multiaxial problems; Numerical procedure to follow yield surfaces

Textbook   Parts I, II: Lecture materials are distributed in the classroom or to be downloaded on the website.

Textbook(supplemental)   Part I: T. Kyoya, "Continuum Mechanics," Morikita (2008) (in Japanese); E. Tanaka, "Kotai Rikigaku No Kiso," Kyoritsu (2014) (in Japanese); A. J. M. Spencer, "Continuum Mechanics," Dover (1980).
Part II: Y. Tomita, " Foundation and Application of Elastoplasticity," Morikita (1995); E. Neto et al., " Computational Methods for Plasticity," John Wiley & Sons (2008).

Prerequisite(s)   Enrolling students are expected to have good knowledge in "Mechanics of Materials," "Continuum Mechanics," or "Mechanics of Solids" courses on the undergraduate level.

Independent Study Outside of Class   Enrolling students are expected to work on the distributed lecture materials and the homework problems.

Web Sites   The URL will be informed during the semester.

Additional Information   The order and hours (weights) for each item are subject to possible change.

Thermal Science and Engineering

Code   10G005   Course Year   Master Course   Term   1st term   Class day & Period   Mon 3rd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   H. Yoshida & M. Matsumoto,

Course Description   Several topics in advanced thermal physics are discussed. From microscopic view points, basics of stochastic process and related topics are given. From macroscopic ones, after the concept of entropy is revisited, applications in global enviroinments and hydrogen energy are described.

Grading   Reports, essays, and/or written examinations.

Course Goals   Microscopic Viewpoints: Ability of multi-scale modelling
Macroscopic Viewpoints: Ability of global environment modelling

Course Topics

Theme	Class number of times	Description
(M) Brownian motion	1	
(M) Transport phenomena and correlation functions	1	
(M) Spectral analysis and fractal analysis	2	
(M) Stochastic process and its applications	3	
(Y) Entropy and free energy: revisit	1	
(Y) Science of atmosphere and ocean	3	
(Y) Hydrogen energy	3	
Check and feedback	1	

Textbook   Not specified.

Textbook(supplemental)

Prerequisite(s)   Elementary thermodynamics, Statistical physics, Heat transfer engineering, Numerical analysis etc.

Independent Study Outside of Class

Web Sites

Additional Information   (2016)
Yoshida: April 11 ~ May 23
Matsumoto: May 30 ~ July 11

Introduction to Advanced Fluid Dynamics

Code   10G007   Course Year   Master Course   Term   1st term   Class day & Period   Fri 1st

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Condensed Matter Physics

Code   10G009   Course Year   Master Course   Term   1st term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10G011

Design and Manufacturing Engineering

Code   10G011   Course Year   Master Course   Term   1st term   Class day & Period   Fri 2nd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Dynamic Systems Control Theory

Code   10G013   Course Year   Master Course   Term   1st term   Class day & Period   Tue 2nd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	5	
	5	
	4	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Engineering Ethics and Management of Technology

Code   10G057   Course Year   Master 1st   Term   1st term   Class day & Period   Thu 3rd

Location   Butsurikei-Kousya   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lectures and Exercise

Language   Japanese   Instructor   Sawaragi, Nishiwaki, Tomita, M. Komori, Tsuchiya, Noda, Sato, Iseda,

Course Description   Basic knowledge of Engineering Ethics and Management of Technology needed for future project leaders in companies and society is taught. Students have to make group work after-class hours as well as presentations of wrapping-up the discussions. Engineering ethics is the field of applied ethics and system of moral principles that apply to the practice of engineering. The field examines and sets the obligations by engineers to society, to their clients, and to the profession. Management of Technology is a set of management disciplines that allows organizations to manage their technological fundamentals to create competitive advantage. This course consists of lectures, exercises, discussions and oral presentations under supervision of professional faculties and extramural lecturers.

Grading   Submission of reports and presentations

Course Goals   To cultivate a spirit of self-sufficiency needed for engineers

Course Topics

Theme	Class number of times	Description
Engineering Ethics	9	1. Introduction to Engineering Ethics (EE) 2.Medical Engineering Ethics 3.EE by Institution of Professional Engineers, Japan and abroad 4.Product Safety and Product Liability 5.Comprehensive Manufacturing and EE (1) 6.Comprehensive Manufacturing and EE (2) 7.Group Discussions 8.History and Philosophy of EE 9.Presentation on exercise of EE
Management of Technology	5	1.Product Portfolio, Strategy for Competition 2.Bussiness Domain and MOT for Marketing 3. Organizational Strategy for Corporates' R & D 4. Management Theory for R & D 5.Presentation on exercise of MOT
Summary	1	

Textbook   No textbook

Textbook(supplemental)   Nothing

Prerequisite(s)   Nothing particular

Independent Study Outside of Class

Web Sites   No Web Site

Additional Information   Nothing particular

Special Topics in Transport Phenomena

Code 10H002   Course Year Master and Doctor Course   Term Spring term   Class day & Period   Location

Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Department of Chemical Engineering, Professor, Ryoichi Yamamoto

Course Description   After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on "Langevin Equation", "Hydrodynamic Interaction", and "Linear Response Theory" will also be given.

Grading   Answers to several questions and exercises, which will be given during the course, are used to judge.

Course Goals   To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

Course Topics

Theme	Class number of times	Description
- Polymeric Liquids / Rheology	6	Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation	3	To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction	2	To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.
Understanding Check	1	

Textbook   Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

Textbook(supplemental)   Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowlter, (Cambridge)

Prerequisite(s)   Under graduate level basic knowledge on "Fluid Mechanics / Transport Phenomena" and basic mathematics including "Vector Analyses" are required.

Independent Study Outside of Class

Web Sites

Additional Information   This is an biennial course which will be open in 2016, 2018, 2020, ...

Advanced Topics in Transport Phenomena   English lecture

Advanced Topics in Transport Phenomena

Code   10H003   Course Year   Master and Doctor Course   Term   Spring term

Class day & Period   Tue 4th   Location   A2-305   Credits   1.5   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   English

Instructor   Department of Chemical Engineering, Professor, Ryoichi Yamamoto

Course Description   After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on "Langevin Equation", "Hydrodynamic Interaction", and "Linear Response Theory" will also be given.

Grading   Answers to several questions and exercises, which will be given during the course, are used to judge.

Course Goals   To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

Course Topics

Theme	Class number of times	Description
- Polymeric Liquids / Rheology	6	Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation	3	To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction	2	To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.
Understanding Check	1	

Textbook   Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

Textbook(supplemental)   Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowlter, (Cambridge)

Prerequisite(s)   Under graduate level basic knowledge on "Fluid Mechanics / Transport Phenomena" and basic mathematics including "Vector Analyses" are required.

Independent Study Outside of Class

Web Sites

Additional Information

Fundamentals of Magnetohydrodynamics

Code   10C076   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   English Lecture

Language   English   Instructor   Tomoaki Kunugi, Atsushi Fukuyama,

Course Description   This course provides fundamentals of magnetohydrodynamics which describes the dynamics of electrically conducting fluids, such as plasmas and liquid metals. The course covers the fundamental equations in magnetohydrodynamics, dynamics and heat transfer of magnetofluid in a magnetic field, equilibrium and stability of magnetized plasmas, as well as illustrative examples.

Grading   Attendance and two reports

Course Goals   The students can understand fundamentals of magnetohydrodynamics which describes the dynamics of electrically conducting fluids, such as plasmas and liquid metals. Moreover, the students will figure out the applications of magnetohydrodynamics to the various science and engineering fields.

Course Topics

Theme	Class number of times	Description
Liquid Metal MHD	7	1. Introduction and Overview of Magnetohydrodynamics 2. Governing Equations of Electrodynamics and Fluid Dynamics 3. Turbulence and Its Modeling 4. Dynamics at Low Magnetic Reynolds Numbers 5. Glimpse at MHD Turbulence & Natural Convection under B field 6. Boundary Layers of MHD Duct Flows 7. MHD Turbulence at Low and High Magnetic Reynolds Numbers
Plasma MHD	8	1. Introduction to Plasma MHD 2. Basic Equation of Plasma MHD 3. MHD Equilibrium 4. Axisymmetric MHD Equilibrium 5. Ideal MHD Instabilities 6. Resistive MHD Instabilities 7. MHD Waves in Plasmas 8. Student Assessment

Textbook   Handout of the presentation will be provided at the lecture

Textbook(supplemental)   P. A. Davidson, "An Introduction to Magnetohydrodynamics," Cambridge texts in applied mathematics, Cambridge University Press, 2001

Prerequisite(s)   Fundamental fluid dynamics and electromagnetics should be learned prior to attend this lecture.

Independent Study Outside of Class

Web Sites

Additional Information

Continuum Mechanics

Code   10F003   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 2nd   Location   C1-192
Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese
Instructor   Kunitomo Sugiura, Tomomi Yagi,

Course Description   Continuum mechanics is a unified basis for solid mechanics and fluid mechanics. The aims of this course are to introduce the continuum mechanics from their basics to the some forms of constitutive law and also to provide students with mathematical way of understanding the continuum mechanics. This course contains the fundamentals of vector and tensor calculus, the basic equations of continuum mechanics, the tensor expressions of elastic problems and further applications.

Grading   Assessment will be based on exam, report and participation.

Course Goals   Fundamental theorems on structural mechanics and design will be learned, and ability to judge the proprieties of each computational structural analysis will be acquired.

Course Topics

Theme	Class number of times	Description
Introductions	1	- Outline of Structural Analysis - Mathematical Preliminaries(Vectors and Tensors)
Matrices and tensors	1	- Summation Convention - Eigenvalues and Eigenvectors
differential and integral calculus of tensors	1	- Quotient Laws - Divergence Theorem
Kinematics	1	- Material Description - Spatial Description - Material derivative
Deformation and strain	2	- Strain tensors - Compatibility conditions
Stress and equilibrium equation	1	- Stress Tensors - Equilbrium Equations
Conservation law and governing equation	1	- Conservation of Mass - Conservation of Linear Momentum - Conservation of Energy
Constitutive equation of idealized material	1	- Perfect Fluid - Linear Elastic Material(Isotropic)
Elastic-plastic behavior and constitutive equation of construction materials	1	- Yield Criteria - Flow Rule - Hardening Rule
Boundary value problem	1	- Governing Equations and Unknowns - Navier-Stokes Equation - Navier Equation
Variational principle	1	- Principle of Virtual Work - Principle of Complementary Virtual Work
Various kinds of numerical analyses	2	- Weighted Residual Method - Finite Element Method
Confirmation of the attainment level of learning	1	Feedback based on the Final Examination

Textbook

Textbook(supplemental)

Prerequisite(s)   Basic knowledge for structural mechanics, soil mechanics and fluid mechanics are required.

Independent Study Outside of Class   As appropriate, the assignments are given based on the content of Lecture.

Web Sites

Additional Information

Structural Stability

Code　10F067　　Course Year　Master and Doctor Course　　Term　1st term　　Class day & Period　Fri 2nd

Location　C1-171　　Credits　2　　Restriction　No Restriction　　Lecture Form(s)　Lecture　　Language　English

Instructor　　Hiromichi SHIRATO, Kunitomo SUGIURA,

Course Description　　Fundamental concept of static and dynamic stability of large-scale structures such as bridges is to be introduced in addition to the way to keep/improve their safety and to evaluate their performance. Basic concept of structural stability and its application and technical subjects to improve safety will be lectured systematically. Furthermore, the practical solutions to the subjects are to be introduced to assure the safety of structures.

Grading　　Grading will be evaluated by written examination, reports and attendance.

Course Goals　　The class aims to cultivate the understanding of static and dynamic stability problems for structural system and make understand the methodology to clarify the limit state. To get knowledge on countermeasures to assure the stability which is applicable to practical design and manufacturing will be also required.

Course Topics

Theme	Class number of times	Description
Elastic Stability under Static Loading	7	Stability of Structures and Failures Basis of Structural Stability Elastic Buckling of Columns Elastic Buckling of Beams & Frames Elastic Buckling of Plates Elasto-plastic Buckling Buckling Analysis
Basic theory of dynamic stability and its application	7	The stability around the equilibrium points based on the state equation of motion in which the nonlinearity of external, damping and restring forces are taken into account. Wind-induced vibration of a square prism (Galloping) and 1dof system with nonlinear spring will be introduced as practical examples. Chaotic motion of a pendulum subjected to periodic external force is also explained as an introduction of chaos theory.
Achievement Check	1	Summary and Achievement Check.

Textbook　　Not specified.

Textbook(supplemental)　　Introduced in class if necessary.

Prerequisite(s)　　It is desired for participants to master structural mechanics, continuum mechanics, mathematical analysis as well as vibration theory.

Independent Study Outside of Class

Web Sites　　none

Additional Information　　none

Structural Dynamics

Code   10F227   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 1st
Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese
Instructor   Igarashi,Furukawa

Course Description   This course deals with dynamics of structural systems and related topics, to provide the theoretical basis to deal with the problems of vibration, safety under dynamic loads and health monitoring associated with infrastructures. The students will study the dynamic response, properties of natural modes and methods of eigenvalue analysis for multi-DOF systems. The topics on the numerical time integration schemes, probabilistic evaluation of structural response to random excitation, and dynamic response control techniques for structures are also studied.

Grading   Based on the results of a final examination, plus homework assignments

Course Goals   (1) To aquire the knowledge on theories and principles of analysis of MDOF systems (2) Systematic understanding of frequency-domain structural response analysis (3) Concept of analysis of numerical time integration schemes (4) Understanding of fundamentals of the random vibration theory

Course Topics

Theme	Class number of times	Description
Introduction	1	Fudamental concepts, harmonic motion
Dynamics of Multi-Degree-Of-Freedom Systems	2	Formulation of Eq. of Motion / Lagrange's method / Normal Modes / Modal Analysis / Modeling of System Damping
Frequency-Domain Analysis of System Response	1	Frequency Response Funcs. / Fourier Transform
Numerical Time Integration	2	Formulation / Stability and Accuracy Analysis of Integration
Random Vibration	6	Overview / Probability Theory / Sequence of i.i.d. Random Variables / Concept of Random Processes / Correlation Funcs. / White Noise / Stochastic Differential Eq. / Lyapunov Eq. / Response to White Noise Excitation / Covariance Matrix Approach / Correlation Funcs. of Random Response / Spectral Representation of Random Processes / Spectral Representation of Structural Response / Application
Structural Response Control	2	Active Control / Semi-Active Control
Achievement Evaluation	1	Students' achievements in understanding of the course material are evaluated.

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

Textbook(supplemental)

Prerequisite(s)   Mechanical vibration (undergraduate level), Complex calculus (integration of analytic functions, Fourier transform, etc.), Probability theory, Linear algebra

Independent Study Outside of Class

Web Sites

Additional Information   There will be homework assignments at the end of most of the lectures.

Applied Hybrid System Engineering

Code   10C621   Course Year   Master Course   Term   1st term   Class day & Period   Location   A1-001

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language

Instructor   Takashi Hikihara,Shinji Doi,Yoshihiko Susuki,Syun'ichi Azuma,

Course Description   Many engineering systems show hybrid dynamical structure, which is accompanied with discrete change of vector flow by control and regulate the trajectory to target dynamically. In the course, the fundamental characteristics and theorems are lectured. The framework of hybrid system, automaton model, and singular perturbation theorem are explain. Dynamic quantizer, power system, and network are picked up as examples.

Grading   Exercise and repots are evaluated.

Course Goals   Students are requested to understand the characteristics of hybrid system, approaching method, and control methods.

Course Topics

Theme	Class number of times	Description
Fundamentals of hybrid system	4	As fundamentals, the definition of hybrid system and the method of modeling is explained.
Singular perturbation and asymptotic expansion	3	Singular perturbation theorema and asymptotic expansion are explained. For the global oscillation of singular perturbed system, analytical and geometrical singular perturbation methods are introduced.
Application of hybrid system-1: power system	3	The application to power system is explained. The outline of power system, then safety and examination, the stability analysis, and the modeling towards control are given.
Application of hybrid system-2: dynamic quantizer	2	As an application, dynamic quantizer is adopted. The outline of the dynamic quantizer, the analysis, and the design of the system are given.
Application of hybrid system-3: networking	3	As an application, the communication network is adopted. The internet network is also explained as an example of modeling and control.

Textbook   Each professors prepare the prints of lectures.

Textbook(supplemental)   No textbook.

Prerequisite(s)   Nothing.

Independent Study Outside of Class

Web Sites

Additional Information   This course is held every two years. The classes will be held on Wednesday or Thursday. Schedule is 4/13,20,27 [Hikihara]   5/11,18,25 [Azuma]   6/1,6/8 [Hikihara]
6/16,6/23,30, 7/7,14 (Thursday)[Doi]   7/21 [extra]

Applied Mathematics for Electrical Engineering

Code   10C601   Course Year   Master Course   Term   1st term   Class day & Period   Thu 1st

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   T. Hikihara & S. Doi,

Course Description   In the class, fundamental mathematics is lectured for electrical engineering, electronics, system engineering, and material science. In particular, system theory, nonlinear dynamics, and particle dynamics in force field can be discussed with mathematical clear image.

Grading   Students are requested to reply to report assignments. The grading is based on the evaluation of the reports.

Course Goals   Professors expect students to model their system and analyze the models theoretically. Students will be requested to understand their system in principle mechanics and control them based on system theory.

Course Topics

Theme	Class number of times	Description
	1	
	2-4	
	3-5	
Introduction 2	1	Relationship between the previous classes and further will be explained. The introduction to nonlinear dynamics will be explained based on oscillation theory.
Hamiltonian mechanics	1-3	Hamiltonian mechanics on linear symplectic space is lectured.
Manifold and vector field	2-4	Manifold is discussed in nonlinear system with relation to vector filed analysis.

Textbook

Textbook(supplemental)   S. Wiggins, Introduction to Applied Nonlinear Dynamical Systems and Chaos, Springer-Verlag.

Prerequisite(s)   Linear algebra

Independent Study Outside of Class

Web Sites   https://www.t.kyoto-u.ac.jp/lecturenotes/gse/kueeng/10C601/syllabus

Additional Information   Appropriate references will be shown in classes.

Space Radio Engineering

Code   10C612   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 3rd

Location   N1 lecture room in the Faculty of engineering building No. 3, A1-131 in Katsura campus, Uji

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language

Instructor   Hiroshi Yamakawa, Hirotsugu Kojima,

Course Description   The present lecture provides the guideline how the technology on the electronics and propulsion system is used for the development of spacecraft and space systems. Furthermore, in order to understand the environment in space, we also give a lecture on the space plasma physics.

Grading   attendance and final examination

Course Goals   Mastery of the way how we can make use of the knowledges of the physics and technology to the space engineering.

Course Topics

Theme	Class number of times	Description
Space environment	2	The space environment in the view point of spacecraft desing such as thermal condition, plasmas, and charging.
Spacecraft system and its related technology	5	The spacecraft system and its technology related to power system, communication system, EMC, and payload desings.
Spacecraft dynamics	3	Spacecraft orbit design and its attitude control
System engineering of spacecraft	4	Spacecraft propulsion system including the advanced systems which make use of solar power, GPS navigation system, and space debris
Feedback	1	We will give a feedback lecture by answering to questions from students.

Textbook

Textbook(supplemental)

Prerequisite(s)   Plasma physics, Electromagnetics. Radio engineering, Electronics

Independent Study Outside of Class

Web Sites

Additional Information

Fracture Mechanics

Code　10G017　　Course Year　Master Course　　Term　2nd term　　Class day & Period　Fri 1st

Location　C3-Lecture Room 3　　Credits　2　　Restriction　No Restriction　　Lecture Form(s)　Lecture　　Language　Japanese

Instructor　Takayuki Kitamura,

Course Description　The basics of the fracture mechanics will be lectured.

Elastic problem, Stress function of a crack, Stress field around a crack tip, Stress intensity factors, Energy release rate, J-integral, Elastic plastic fracture mechanics, Interfacial fracture mechanics etc.

Fracture toughness, Crackings in fatigue, environmental fatigue and creep-fatigue etc.

Grading　Mini-reports will be evaluated.

Course Goals　The objective of this lecture is to master the basic knowledge of the fracture mechanics, and to be able to discuss about material strength on the basis of the knowledge.

Course Topics

Theme	Class number of times	Description
Introduction	2	Introduction 　Examples of fracture in real components 　Deformation and fracture Stress concentration and singular stress field 　Basics of solid mechanics
Linear fracture mechanics	3	Mechanics of cracked body under linear elasticity 　Singular stress field near a crack tip, Stress intensity factor, Energy release rate, J-integral, Small scale yielding Interfacial fracture mechnics in dissimilar materials, Stress field near an interface edge, Stress field near an interfacial crack
Nonlinear fracture mechanics	2	Fracture mechanics in non-linear elastic solid HRR singular field, J-integral, creep Stress field near an interface edge
farcture phenomenon and mechanics	3	Application of fracture mechanics to fracture toughness Application of fracture mechanics to fatigue cracking Application of fracture mechanics to environmental cracking Application of fracture mechanics to fatigue cracking at high temperatures
fracture mechanics on growth of small cracks	1	Growth of physicall small crack Growth of microstrucually small crack
Smakk crack and cavity in creep	1	Cavity growth by diffusion creep Difference of stress filed between crack and cavity
Fracture nanomechanics	1	Research works on fracture mechanics in nanometer scale
Fracture in atomic scale	1	Research works on fracture in atomic scale
Summary	1	Discussion and report

Textbook　The teacher provide articles for this lecture.

Textbook(supplemental)

Prerequisite(s)　The traditional material strength and the linear elastic mechanics should be learned before taking this lecture.

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Finite Element Methods

Code 10G041 Course Year Master and Doctor Course Term 1st term Class day & Period Wed 2nd

Location C3-Lecture Room 2 Credits 2 Restriction No Restriction Lecture Form(s) Lecture and Practice

Language English Instructor Kotera and Nishiwaki,

Course Description This course presents the basic concept and mathematical theory of the Finite Element Method (FEM), and explains how the FEM is applied in engineering problems. We also address important topics such as the physical meaning of geometrical non-linearity, material non-linearity, and non-linearity of boundary conditions, and we explore numerical methods to deal with these nonlinearities. Also, we guide students in class in the use of software to solve several numerical problems, to develop practical skill in applying the FEM to engineering problems.

Grading Grading is based the quality of two or three reports and the final exam.

Course Goals The course goals are for students to understand the mathematical theory of the FEM and the numerical methods for analyzing non-linear problems based on the FEM.

Course Topics

Theme	Class number of times	Description
Basic knowledge of the FEM	3	What is the FEM? The history of the FEM, classifications of partial differential equations, linear problems and non-linear problems, mathematical descriptions of structural problems (stress and strain, strong form and weak form, the principle of energy).
Mathematical background of the FEM	2	Variational calculus and the norm space, the convergence of the solutions.
FEM formulations	3	FEM approximations for linear problems, formulations of iso-parametric elements, numerical instability problems such as shear locking, formulations of reduced integration elements, non-conforming elements, the mixed approach, and assumed-stress elements.
Classifications of nonlinearities and their formulations	4	Classifications of nonlinearities and numerical methods to deal with these nonlinearities.
Numerical practice	2	Numerical practice using COMSOL.
Evaluation of student achievements	1	

Textbook

Textbook(supplemental) Bath, K.-J., Finite Element Procedures, Prentice Hall

Belytschko, T., Liu, W. K., and Moran, B.., Nonlinear Finite Elements for Continua and Structures, Wiley

Prerequisite(s) Solid Mechanics

Independent Study Outside of Class

Web Sites

Additional Information

10B418

Strength of Advanced Materials

Code   10B418   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   M. Hojo and M. Nishikawa,

Course Description   The mechanism underlying mechanical and functional properties are lectured for advanced materials used and developed in advanced fields of current engineering. In particular, advanced composite materials, used for aircraft structure etc., are introduced, with a detailed description of the relationship between microscopic constituent materials and macroscopic properties from the perspective of multiscale mechanics; also the anisotropy of their properties, their fatigue and fracture properties are described in the basic discipline for strength of materials. The latest applications are introduced in the field of various transportation systems including airplanes.

Grading   Grading is based on the reports. The assignments will be given around three times.

Course Goals   The course goal is to understand basic concepts of composite materials and the underlying mechanism of their mechanical properties from multiscale viewpoints, while the phsyical understanding of composites is developed based on multiple disciplines.

Course Topics

Theme	Class number of times	Description
Concept of composite materials	2	The concept and definition of composite materials, their constituent materials and manufacturing methods are illustrated. Their application to aircraft structures etc. are also introduced.
Mechanical properties of microscopic constituent materials	2	Resin for matrix and various fiber types are explained including their structure and mechanical properties. The weakest link model and Weibull distribution are described as a basis of the statistic nature of strength.
Basic mechanical properties	4	The specific strength, the specific stiffness, and the rule of mixture for elastic modulus and strength are lectured. In particular, the detailed explanation is made to the anisotropy of elastic modulus, independent elastic constants in the generalized Hookean law, the anisotropic failure criteria, and laminate theory. The relationship between the mechanical properties of microscopic constituent materials and macroscopic properties of composite materials is also illustrated.
Micromechanics	2	The mechanism of transverse fracture is illustrated. The mechanical models are described for short fiber reinforced composites and particle dispersed composites. The micromechanical analyses based on finite element method is also illustrated for the physical understanding of the strength of composite materials.
Fracture mechanics properties	2	Fracture mechanics of anisotropic materials are described. The interlaminar fracture toughness and interlaminar fatigue crack propagation, the critical issues in the application of composite structures, are explained including their underlying mechanism.
Superconducting materials	1	High-temperature superconducting materials are the composite materials consisting of metals and fibrous superconducting materials made of oxides. The mechanism are explained for understanding that their mechanical properties so much control their electric properties.
Process and mechanical properties of composite materials	1	The molding and machining process of composite materials is explained to relate it to their mechanical properties. Fiber preform, the selection of resin, intermediate materials, machining and assembly and inspection methods are overviewed from the academic viewpoints.
Academic achievement test	1	Academic achievements is assessed.

Textbook   Supplementary handouts will be distributed in the class.

Textbook(supplemental)   D.Hull and T.W.Clyne, "An Introduction to Composite Materials," Cambridge University Press.

Prerequisite(s)   Mechanics of Materials, Continuum Mechanics, Fundamentals of Materials, Solid Mechanics, Adv.

Independent Study Outside of Class

Web Sites

Additional Information   The order and the item in the course are possibly subject to change.

Dynamics of Solids and Structures

Code   10G230   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 2nd
Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture
Language   Japanese   Instructor   S. Biwa and T. Hayashi

Course Description   Fundamental principles for dynamic deformations of solids and structures are examined. In particular, basic characteristics of elastic wave motion in solid media are emphasized. Responses of materials and structures to impact loading are also considered.

Grading   Grading is based on the attendance, homework reports and the final examination (possibly replaced by reports).

Course Goals   This course aims to establish the understanding of basic characteristics of dynamic deformations and elastic waves in solid media, as well as to learn about technological applications of ultrasound in a variety of fields extending from micro- to macro-scales. Particular emphasis is put on the mathematical aspects of the physical phenomena involved.

Course Topics

Theme	Class number of times	Description
Fundamentals of elastodynamics	1	Expressions of stress and strain; Conservation laws; Hooke's law; Principle of virtual work; Hamilton's principle and its applications
Basics of wave propagation	2	One-dimensional wave equation; D'Alembert's solution; Harmonic waves; Spectral analysis; Waves in structural members; Dispersive waves; Phase and group velocities
Stress waves in a bar	1	Reflection and transmission at bi-material connection; Reflection at a free end; Stress wave by tensile loading at a bar end; Plastic wave
Waves in isotropic elastic media	1	Navier's equations; Longitudinal and transverse waves; Plane elastic waves in isotropic solids
Waves in anisotropic elastic media	1	Voigt representation; Plane elastic waves in anisotropic solids; Christoffel's equation; Propagation and polarization directions; Slowness surfaces
Reflection and transmission	2	Reflection and transmission of normal incident waves; Snell's law; Mode conversion; Reflection and refraction of oblique incident waves.
Guided elastic waves	3	Bulk waves and guided waves; Rayleigh wave; Love wave; Lamb wave.
Numerical analysis of elastic waves	2	Finite difference method; Finite element method; Boundary element method
Measurements of vibration and waves	2	Comparison of various measurement techniques; Analogue and digital data analysis

Textbook   No textbooks are assigned. The lecture is mainly given in a blackboard style. Print-outs are handed in when needed.

Textbook(supplemental)

Prerequisite(s)   Basic knowledge of mechanics of materials (solid mechanics, continuum mechanics) is expected.

Independent Study Outside of Class   Enrolling students are expected to work on the lecture materials and the homework problems.

Web Sites

Additional Information   The time units and weights for each item on the above list are subject to possible changes.

Thermophysics for Thermal Engineering

Code   10B622   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 1st

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   M. Matsumoto

Course Description   Based on elementary thermodynamics and statistical physics, I will describe non-equilibrium thermodynamics and advanced statistical physics, including phase transition, pattern formation, and entropy production.

Grading   Paper assignments

Course Goals   Understanding the principle mechanisms of phase transition, cooperation phenomena, patern formation, and relaxation phenomena, in terms of advanced statistical mechanics and non-equilibrium thermodynamics.

Course Topics

Theme	Class number of times	Description
Elementary statistical physics: review	1	Review of equilibrium statistical mechanics
Phase transition as a cooperative phenomenon	3	Statistical mechanics of interacting particle system - Exact calculation - Monte Carlo simulation - Mean field approximation
Pattern formation of non-equilibrium systems	4	After a time dependent Ginzburg-Landau (TDGL) model is introduced, formation of spatial patterns is discussed from various viewpoints.
Equilibrium thermodynamics: review	1	Review of elementary thermodynamics
Non-equilibrium thermodynamics: Basics	2	System stability and the principle of irreversible process are discussed in terms of thermodynamics.
Non-equilibrium thermodynamics: Applications	3	- Entropy production - Linear response theory - Onsager's reciprocal relation
Check and Feedback	1	

Textbook   Lecture note will be prepared.

Textbook(supplemental)   will be listed in the class.

Prerequisite(s)   Undergraduate level of Thermophysics, Heat transfer phenomena, and Statistical physics

Independent Study Outside of Class

Web Sites

Additional Information

Transport Phenomena

Code 10G039 Course Year Master and Doctor Course Term 2nd term Class day & Period Fri 3rd

Location C3-Lecture Room 2 Credits 2 Restriction Lecture Form(s) Lecture Language Japanese

Instructor Nakabe, Kazuyoshi,Tatsumi, Kazuya,

Course Description The important learning objective of this class is to understand the fundamental mechanisms of momentum, heat, and mass transfer phenomena, the knowledge of which will be markedly required for the thermal energy control technologies to further practice conservations of natural resources and energies for sustainable development. Heat and mass transfer processes consisting of conduction and forced/natural convection will be highlighted in detail, referring to the similarity characteristics of flow velocity, fluid temperature, and species concentration. Some topics on Reynolds stress, turbulent heat flux, and phase change will be introduced, expanding to their numerical models, together with some recent trends of high-tech heat and energy devices.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Surrounding Examples of Transport Phenomena	1	
Governing Equations and Non-Dimensional Parameters	3 4	
Boundary Layer Flows	2 3	
External and Internal Flows	1 2	
Turbulent Phenomena	2 3	
Topics of Flow and Heat Transfer Mechanism	2 3	
Estimation on Study Achievement	1	

Textbook

Textbook(supplemental) Example: Transport Phenomena (Bird, R.B. et al.)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Fluid Dynamics

Code　10G019　　Course Year　Master 1st　　Term　2nd term　　Class day & Period　Tue 1st　　Location

Credits　2　　Restriction　　　Lecture Form(s)　Lecture　　Language　Japanese　　Instructor　K. Aoki & S. Kosuge

Course Description　　This course aims at reviewing and supplementing the introductory molecular gas dynamics that is taught as a part of the course "Introduction to Advanced Fluid Dynamics" in the first semester. In this course, low-pressure gas flows and gas flows in micro scales (i.e., the so-called non-equilibrium gas flows) are considered. In molecular gas dynamics, the notions of intermolecular collisions (or interactions) and molecular velocity distribution function, which are not included in ordinary fluid and gas dynamics, are required, and some efforts are needed to master these notions. Once they have been mastered, however, it becomes easier to understand various phenomena arising in fluid and gas dynamics. The final aim of the present course is to master these notions.

Grading　　Some reports for exercises are required, on the basis of which the evaluation is made. The rate of attendance at the course is also taken into account for evaluation.

Course Goals　　The notion of kinetic theory based on the velocity distribution function is to be mastered, and the ability of understanding and applying kinetic modeling, which prevails in various fields, is to be cultivated.

Course Topics

Theme	Class number of times	Description
Review of basic things	3	The definition of the velocity distribution function and its relation to macroscopic quantities, the transport of physical quantities, and the Boltzmann equation are reviewed.
Supplement to basic things	4	The symmetry relations for the extended collision integral, the boundary conditions for the Boltzmann equation, the H theorem and the Darrozes-Guiraud inequality, model Boltzmann equations, exact solutions of the form of local Maxwellian distribution, the mean free path, and nondimensionalization are explained or proved.
Generalized slip-flow theory	4	When the Knudsen number is small, a systematic asymptotic analysis of the steady boundary-value problem of the Boltzmann equation leads to partial differential equations of fluid-dynamic type and their boundary conditions of slip type. An introduction to this theory is given.
DSMC method	4	For general Knudsen numbers, direct numerical solution of the Boltzmann equation is needed. The DSMC method, which is one of the standard numerical methods, is introduced briefly, and some numerical examples are presented.

Textbook

Textbook(supplemental)　　Y. Sone & K. Aoki, Molecular Gas Dynamics (Asakura, Tokyo, 1994) (in Japanese); Y. Sone, Molecular Gas Dynamics (Birkhauser, Boston, 2007).

Prerequisite(s)　　It is required to have followed the course "Introduction to Advanced Fluid Dynamics" in the first semester.

Independent Study Outside of Class

Web Sites

Additional Information

Engineering Optics and Spectroscopy

Code   10G021   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Masahiro Hasuo, Taiichi Shikama

Course Description   Optics are widely used in many areas of modern science and technology. Students will learn the physical properties of light and light-matter interactions, and their applications. Topics such as light propagation in dielectric media, crystal optics, quantum optics, and lasers will be explored. Interactions of light with atoms, molecules and solids as examples will be also explored with introduction of the fundamentals of spectroscopy and their applications.

Grading   Grade evaluation will be based on report examination.

Course Goals   Understand the principles of optical engineering and spectroscopy.
Develop application abilities based on the principle understanding.

Course Topics

Theme	Class number of times	Description
Dispersion of light	6	propagation of light in dielectric media (Lorentz model), crystal optics, nonlinear optics
Quantum optics	1	quantum theory of light, principles of lasers
Light-matter interactions	5	light-induced transition, quantum states of atoms, molecules, and solids, and rules governing the transitions (selection rules)
Selection rules and group theory	2	introduction to group theory and its application to the selection rules
Confirmation of the achievement	1	

Textbook   Recommended books will be discussed in class.

Textbook(supplemental)   Lecture notes will be distributed.

Prerequisite(s)   Undergraduate-level electromagnetism and quantum mechanics.

Independent Study Outside of Class

Web Sites

Additional Information

Physics of Neutron Scattering

Code   10B628   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 4th

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   K. Mori, Y. Onodera

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

High Energy Radiation Effects in Solid

Code   10B631   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 3rd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   A. Kinomura, Q. Xu

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Experimental Techniques and Analysis in Engineering Physics

Code   10B634   Course Year   Master and Doctor Course   Term   (intensively; in summer vacation)

Class day & Period   Location   Research Reactor Institute   Credits   2   Restriction   No Restriction

Lecture Form(s)   Exercise   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Robotics

Code   10B407   Course Year   Master Course   Term   2nd term   Class day & Period   Mon 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Fumitoshi Matsuno,

Course Description   Understanding of intelligent behaviors of living things is very interesting. And realization of their intelligent motion by a robot is also attractive for mechanical engineering. In this lecture, we consider basic understanding of beautiful human skill "manipulation" on the point of view of dynamics and control. First modeling methodologies for a rigid multibody system and a general dynamic model of a manipulator are provided. Next, a typical nonlinear control law is introduced and some problems for applying the controller are shown. Based on nature of the dynamics of the manipulator, a very simple and robust controller can be derived by designing energy of the system. This lecture provides modeling methodologies and controller design strategies of the rigid multibody system and we analyze a beautiful human skill of the manipulation.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Mechanical Functional Device Engineering

Code   10G025   Course Year   Master 1st   Term   2nd term   Class day & Period   Wed 3rd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory for Design Systems Engineering

Code   10Q807   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Tetsuo Sawaragi and Hiroaki Nakanishi,

Course Description   The lecture focuses on the human design activity; designing artifacts (things, events and systems) based on human intuitions, and designing human-machine systems in which the relations between human and objects are of importance.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

High Precision Engineering

Code   10B828   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 3rd
Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture
Language   Japanese+Englihs   Instructor   Ari Ide-Ektessabi,
Course Description
Grading
Course Goals
Course Topics

Theme	Class number of times	Description
Introduction	1	Introduction to High Precision Analysis Using Synchrotron Radiations
High precision Measurement	2	Synchrotron Radiation and X-ray Fluorescence Spectroscopy
High precision Measurement	3	Micro Imaging and Quantitative XRF micro Analysis
High precision Measurement	4	Fine Structure Spectroscopy
High precision Measurement	5	Fine Structure Spectroscopy
High precision Measurement	6	Synchrotron Radiation Measurement
Applications in bio-nano technology	7	Elemental Images of Single Neurons by Using SR-XRF I
Applications in bio-nano technology	8	Elemental Images of Single Neurons by Using SR-XRF II
Applications in bio-nano technology	9	Elemental Imaging of Mouse ES Cells(Application)
Applications in bio-nano technology	10	Application of Synchrotron Radiation in the Investigation of process of neuronal differentiation
Applications in bio-nano technology	11	Chemical State Imaging for Investigations of Neurodegenerative Disorders (Parkinsonism-Dementia Complex)
Applications in bio-nano technology	12	Chemical State Imaging for Investigations of Neurodegenerative Disorders: Chemical State of Iron in Parkinsonism Dementia Complex (PDC)
Applications in bio-nano technology	13	Comparison with other techniques
Applications in bio-nano technology	14	Comparison with other techniques
	15	

Textbook

Textbook(supplemental)   Application of Synchrotron Radiation, Arid Ide-Ektessabi, Sp ringer 2007

Prerequisite(s)

Independent Study Outside of Class

Web Sites   http://ocw.kyoto-u.ac.jp/graduate-school-of-engineering-jp/ultra-high-precision-analysis/schedule

Additional Information

Biomechanics

Code 10V003 Course Year Master and Doctor Course Term 1st term Class day & Period Wed 4th

Location Credits 2 Restriction Lecture Form(s) Language Japanese Instructor Taiji Adachi,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biomolecular Dynamics

Code 10D450   Course Year   Master and Doctor Course   Term 2nd term   Class day & Period   Thu 3rd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Environmental Fluid Dynamics

Code 10B440 Course Year Master and Doctor Course Term 2nd term Class day & Period Wed 2nd

Location C3-Lecture Room 5 Credits 2 Restriction No Restriction Lecture Form(s) Lecture

Language Japanese Instructor ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	4	
	6	
	5	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Turbulence Dynamics

Code   10Q402   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 3rd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Hanazaki,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Crystallography of Metals

Code   10G055   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 3rd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description   Metallic crystal structure and deformation behavior are lectured on the basis of metal physics and dislocation theory. Especially, mechanical properties of dislocation and its substructure, which is changed in association with deformation, are introduced, and the effect of grain boundary and free surface on dislocation motion is explained.

Grading   Reporting assignment

Course Goals   The objective of this lecture is to deepen a further understanding of crystal growth methods, the dislocation theory and industrial problems.

Course Topics

Theme	Class number of times	Description
Introduction	1	Introduction Ideal strength and slip deformation Concept of dislocation Simulation
Basis of crystallography	1	Typical crystallographic structure Allotropic transformation Stereographic projection of crystal
High temperature and vacuum techniques	1	Furnace Vacuum pump
Crystal breeding	2	Single- and bi-crystal growth Crystal growth Vapor deposition and thin film
Dislocation theory	3	Plastic deformation of crystal Definition and type of dislocation Strain field around dislocation Dislocation reaction Dislocation multiplication
Mechanical properties of single- and bi-crystals	1	Dislocation substructure Grain boundary structure Reaction between dislocation and grain boundary Deformation of micro- and nano- materials
Fatigue	3	Fatigue of single crystal Fatigue dislocation substructure Fatigue cracking mechanism Fatigue of micro- and nano- materials
Observation and analysis techniques	2	Introduction of electron microscope and observation case
Summary	1	Discussion and report

Textbook   The teacher provide articles for this lecture.

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10Q610

Seminar: Dynamics of Atomic Systems

Code   10Q610   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 5th

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture + Exercise

Language   Japanese   Instructor   M. Matsumoto, M. Nishikawa, R. Matsumoto, T. Shimada, Y. Inoue

Course Description   Particle simulations are a tool of analyzing microscopic phenomena, and widely used in various fields of science and engineering. After providing the basics of particle simulation methods through lectures and exercises, we show various practical applications in thermofluids, solid materials, biophysics, and quantum systems.

Grading   Reports, presentation/discussion

Course Goals   - Understanding the basics of particle simulations - Mastering data analysis techniques

Course Topics

Theme	Class number of times	Description
Basics of MD simulations (M.Matsumoto)	5	- Numerical simulation of equations of motion - Model potentials - Data analysis - Equilibrium vs. non-equilibrium
Application: Thermofluidal systems (M. Matsumoto)	2	- Lennard-Jones fluids - Interface, phase change, energy transport, etc.
Application: Polymeric materials (Nishikawa)	2	- Fundamentals on mechanical (viscoelastic) properties of polymer materials - Application of molecular dynamics method of polymer materials
Application: Biosystems (Inoue)	1	- MD simulation of biomolecular systems - Recent examples
Application: Solid systems (R. Matsumoto)	2	- Deformation and destruction - Alternative methods
Application: Quantum systems (Shimada)	2	- First principle MD - Mechanical and electronic properties on nanoscale
Check and Feedback	1	

Textbook

Textbook(supplemental)

Prerequisite(s)   Elementary Level of Analytical mechanics, Quantum mechanics, Material science, Thermodynamics, Statistical physics, Numerical analysis

Independent Study Outside of Class

Web Sites

Additional Information

Neutron Science Seminor 1

Code   10V007   Course Year   Master and Doctor Course   Term   1st term   Class day & Period

Location   Research Reactor Institute   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Neutron Science Seminar II

Code   10V008   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period

Location   Reseach Reactor Institute   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   K. Mori

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	2	
	2	
	9	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Applied Mechanics A

Code 10W025 Course Year Master and Doctor Course Term 1st term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Seminar Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	-	
	-	
	-	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Applied Mechanics B

Code 10W027   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits 2   Restriction   Lecture Form(s) Seminar   Language Japanese   Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	-	
	-	
	-	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Applied Mechanics B

Code 10W027   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits 2   Restriction   Lecture Form(s) Seminar   Language Japanese   Instructor ,

Patent Seminar

Code　10G029　Course Year　Master Course　Term　2nd term　Class day & Period　Fri 2nd　Location

Credits　2　Restriction　No Restriction　Lecture Form(s)　　Language　Japanese　Instructor　,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	3	
	2	
	2	
	5	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10G203

Micro Process and Material Engineering

Code   10G203   Course Year   Master Course   Term   1st term   Class day & Period   Mon 4th

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   H. Kotera,O. Tabata,K. Eriguchi,I. Kanno,T. Tsuchiya,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Semiconductor microfabrication	3	
Thin-film process and evaluation	3	
Silicon micromachining	3	
3D lithography	3	
Soft-micromachining	2	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Microsystem Engineering

Code   10G205   Course Year   Master Course   Term   2nd term   Class day & Period   Fri 4th   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   O. Tabata,H. Kotera,T. Tsuchiya,R. Yokokawa,

Course Description   Microsystem covers not only technologies related to individual physical or chemical phenomenon in micro scale, but also complex phenomena which are eveolved from their interaction. In this course, the physics and chemistry in micro and nanoscale will be lectured in contrast to those in macro scale. The various kinds of application devices (ex. physical (pressure, flow, force) sensors, chemical sensors, biosensors, actuators (piezoelectric, electrostatic, and shape memory) and their system are discussed.

Grading   The evaluation will be based on the reports given in each lecture.

Course Goals   Understand the theory of sensing and actuating in microsystem. Acquire basic knowledge to handle various kinds of phenomena in microscale.

Course Topics

Theme	Class number of times	Description
MEMS modeling	2	Multi-physics modeling in microscale. Electro-mechanical coupling analysis.
MEMS simulation	2	System level simulation in MEMS.
Electrostatic microsystem	3	Electrostatic sensors and actuators. Theory and application devices.
Physical sensors	4	Physical sensors as a fundamental application in microsystem. Accelerometer, vibrating gyroscope, pressure sensors.
Micro total analysys system	4	Chemical analysis system and bio-sensing device using microsytem.

Textbook   Provided in the lecture.

Textbook(supplemental)   Provided in the lecture.

Prerequisite(s)   Students are required to take the 10G203 course "Micro Process and Material Engineering".

Independent Study Outside of Class

Web Sites

Additional Information   The student can register only to this class 10G205, but it is required to be able to take consecutive classes at Friday 4th and 5th. Those students who want to take this course has to contact Prof. Tabata (tabata@me.kyoto-u.ac.jp) by the end of 1st term. The student of this class is strongly recommended to take a course 10V201 "Introduction to the Design and Implementation of Micro-Systems"(10V201), which is a practice for designing microsystem. Those who want to take 10V201 have to take training course for CAD in advance.

10G209

Multi physics Numerical Analysis

Code   10G209   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 1st

Location   C3-Lecture Room 3   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	2	
	2	
	5	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Theory of Condensed Matter

Code   10B619   Course Year   Master Course   Term   2nd term   Class day & Period   Mon 2nd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Akitomo TACHIBANA

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Solid State Physics 1

Code   10G211   Course Year   Master 1st   Term   2nd term   Class day & Period   Wed 1st

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Precision Measurement and Machining

Code   10G214   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location C3 seminar room c1   Credits 2   Restriction No Restriction   Lecture Form(s) Lecture   Language

Instructor   A. Matsubara and S. Ibaraki,

Course Description   This course gives the principles of precision measurement and machining process for the meso-micro-nano metric fabrication. The optical measurement technologies (e.g. laser interferometer, optical encoders) and cutting technologies (e.g. cutting mechanics, tool, machine) are shown.

Grading   Small exams in the term and the final exam

Course Goals   Understand the basic principles of precision mesurement and machining associated with the applications

Course Topics

Theme	Class number of times	Description
Basics of measurement and machining	1	Concept of accuracy, precision, Relation of measurement, machining, and control
Basics of precision measurement	2	
Optical mesurement	4	
	3	
	1	
	2	
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to the Design and Implementation of Micro-Systems

Code   10V201   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 5th

Location   C3-Lecture room 1 or 3   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture and Pactice   Language   English

Instructor   O. Tabata,H. Kotera,T. Tsuchiya,R. Yokokawa,

Course Description   This is a joint lecture with Hong Kong University of Science and Technology (HKUST). A team consists of two students from each University work together to fullfill the assignment (design a microsystem) through paper survey, analysis,design, and presentation. A student can acquire not only the basic knowledge of a microsystem, but also comprehensive ability of English such as technical knowledge in English, skill for team work, and communication.

Grading   Presentation, Assignments, and Achievement

Course Goals   Acquire the knowledge and skill to design and analyze a microsystem.

Course Topics

Theme	Class number of times	Description
Tutorial on microsystem CAD software	3	Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.
Lecture and Task Introduction	2	Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechical Systems) utilizing microfabrication technology.
Design and analysis work	3	Analyze and design a microsystem by communicating with a team member of HKUST.
Presentation I	2	The designed device and its analyzed results is presented in detail by team in English.
Evatuation of device	3	Evaluate the fabricated microsystem.
Presentation II	2	The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.

Textbook

Textbook(supplemental)

Prerequisite(s)   Students are required to take the 10G203 course "Micro Process and Material Engineering" provoded in 1st term.

Independent Study Outside of Class

Web Sites

Additional Information   The student of this class is required to register to the course 10G205 "Microsystem Engineering" provided at Friday 4th so as to be able to take consecutive classes at Friday 4th and 5th. Those who want to take this course have to take training course for CAD in advance. Those students who want to take this course has to contact Prof. Tabata (tabata@me.kyoto-u.ac.jp) by the end of 1st term.

Introduction to Biomedical Engineering

Code   10W603   Course Year Master and Doctor Course   Term 1st term   Class day & Period   Location

Credits   2   Restriction   No Restriction   Lecture Form(s) Intensive Lecture   Language Japanese

Instructor   ,,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Theory of Molecular Physics

Code   10B617   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Senami, Junior associate professor (Lecturer)

Course Description   Basics for the application of quantum theory to molecular physics and recent progress. Main topics: analytic mechanics, relativistic quantum mechanics, quantum field theory, and path integral.

Grading   Homework paper instructed in class

Course Goals

Course Topics

Theme	Class number of times	Description
1. Analytic mechanics and symmetry in physics	2	Principle of least action, Equation of motion, Hamiltonian mechanics, Symmetry and conservation law in physics, Noether's theorem, Group theory
2. Classical relativistic theory	2	Invariance of the speed of light, Lorentz transformation, Relativistic form of electromagnetism, Four component vector potential
3. Relativistic quantum mechanics	3-5	Relativistic equation of motion, Nonrelativistic limit of Dirac equation, Covariance of Dirac equation, Plane wave solution for Dirac equation and negative energy, Hole theory and problem
4. A primer of quantum field theory	2-4	Field operator, Charge conjugation, Noether's theorem, Gauge transformation and gauge symmetry
5. Path integral	3	Time evolution and propagator, Transition amplitude and path integral, Aharonov-Bohm effect, Path integral in quantum field theory
Confirmation	1	

Textbook

Textbook(supplemental)   J. D. Bjorken, S. D. Drell, Relativistic Quantum Mechanics

J. J. Sakurai, Modern Quantum Mechanics, and Advanced Quantum Mechanics

R. P. Feynmann, A. R. Hibbs, Quantum Mechanics and Path Integrals

Prerequisite(s)   Quantum Mechanics

Independent Study Outside of Class

Web Sites

Additional Information   If English support is required, please contact the instructor by email. Then words written on a blackboard and some supplementary documents are provided in English.

Quantum Theory of Chemical Physics

Code   10Q408   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Akitomo TACHIBANA

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Solid State Physics 2

Code   10V205   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Transport Phenomena in Reactive Flows

Transport Phenomena in Reactive Flows

Code   10G423   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 1st

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English   Instructor   YOSHIDA Hideo,IWAI Hiroshi,

Course Description   This lecture is designed for the students who want to gain their knowledge and understanding on transport phenomena associated mainly with convective flows with chemical reactions. It starts with a brief review of undergraduate level subjects followed by more advanced discussion on heat and mass transfer with reactions. The reactions of interest in the lecture include combustion (oxidation), reforming and electrochemical reactions. As the reactions may proceed on catalysts, the discussion covers the catalytic surface reactions, reactions in porous media as well as gas phase reactions. The students are expected to have learned fundamentals of Fluid dynamics, Thermodynamics and Heat transfer during their undergraduate courses.

Grading   Grade evaluation is based on attendance, short reports and one's term paper submitted at the end of the semester.

Course Goals   Starting from the basic heat and mass transfer, the lecture aims to expand the students' comprehensive understanding on transport phenomena in physicochemical processes including thermochemical and electrochemical reactions.

Course Topics

Theme	Class number of times	Description
Transport phenomena in reactive flows	14	Transport phenomena in convective flows with chemical reactions including combustion (oxidation), reforming and electrochemical reactions.
Achievement Confirmation	1	Achievement Confirmation

Textbook

Textbook(supplemental)

Prerequisite(s)   Fluid dynamics, Thermodynamics, Heat transfer

Independent Study Outside of Class

Web Sites

Additional Information   This course will not be opened in 2015.

Jet Engine Engineering

Code   10G401   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 1st

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Optimum System Design Engineering

Code   10G403   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Propulsion Engineering, Adv.

Code   10G405   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 1st

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Gas Dynamics, Adv.

Code   10G406   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Aerospace Systems and Control

Code   10G409   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	4	
	4	
	4	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Fluid Dynamics for Aeronautics and Astronautics

Code   10G411   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 1st

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	3	
	3	
	4	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Flight Dynamics of Aerospace Vehicle

Code 10C430 Course Year Master and Doctor Course Term 1st term Class day & Period Mon 4th

Location C3-Lecture Room 3 Credits 2 Restriction Lecture Form(s) Lecture Language Japanese

Instructor Kei Senda, Sinya Aoi

Course Description Flight Dynamics and Control of Aerospace Vehicles including Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechanics, etc.

Grading Evaluation depends on marks of examination (80%) and exercises (20%). Both marks should be 60% or better.

Course Goals To understand analytical mechanics through flight dynamics of aerospace vehicles: Basic items of Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechanics, etc.

Course Topics

Theme	Class number of times	Description
Analytical Mechanics	7	1. Newton equations, 2. Lagrange equations, 3. Hamilton equations
Orbital Mechanics	4	1. Motions in central force field, 2. Conservation law, 3. Orbit transition
Attitude Dynamics and Control	4	1. Kinematics of rotation, 2. Attitude mechanics, 3. Stability analysis of equilibrium points, 4. Attitude Control

Textbook

Textbook(supplemental) L. D. Landau and E. M. Lifshitz: Mechanics, Volume 1 (Course of Theoretical Physics

Herbert Goldstein: Classical Mechanics

Toda and Nakajima: Introductory course of physics #1, #2, #10, etc. (Iwnami Shoten)

Prerequisite(s) Foundation of mechanics and mathematics, Flight Dynamics of Aerospace Vehicle (Undergraduate)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Engineering Science of Ionized Gases

Code   10V401   Course Year   Doctor Course   Term   2nd term   Class day & Period   Mon 3rd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Seminar

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Gas Dynamics

Code   10V412   Course Year   Doctor Course   Term   1st term   Class day & Period   Tue 3rd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Fluid Dynamics for Aeronautics and Astronutics

Code   10V405   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 5th

Location   C3-Lecture Room 5   Credits   2   Restriction   Lecture Form(s)   Seminar   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	14	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Aerospace systems

Code   10R410   Course Year   Doctor Course   Term   2nd term   Class day & Period   Mon 4th

Location   C3-Lecture Room 2   Credits   2   Restriction   Lecture Form(s)   Seminar   Language   Japanese

Instructor   ,

Course Description

Grading   Evaluation depends on marks of presentation, report, and so on.

Course Goals

Course Topics

Theme	Class number of times	Description
Aerospace Systems	15	1. Reading textbooks 2. Reviewing journal papers

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Systems and Control

Code   10R419   Course Year   Doctor Course   Term   1st term   Class day & Period   Tue 4th

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Seminar

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Optimum System Design Engineering

Code   10V407   Course Year   Doctor Course   Term   2nd term   Class day & Period   Tue 3rd

Location C3-Lecture Room 2   Credits 2   Restriction No Restriction   Lecture Form(s) Seminar and Exercise

Language   Japanese   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Thermal Engineering Seminar

Code   10V409   Course Year   Doctor Course   Term   1st term   Class day & Period   Fri 3rd

Location   C3-Lecture Room 3   Credits   Restriction   Lecture Form(s)   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Mechanics of Functional Solids and Structures

Code 10V413   Course Year Doctor Course   Term 2nd term   Class day & Period Wed 4th

Location C3-Lecture Room 5   Credits 2   Restriction No Restriction   Lecture Form(s) Seminar

Language Japanese   Instructor S. Biwa and T. Hayashi

Course Description   This Seminar is to review advanced topics related to materials and structural systems involved in aeronautics and astronautics, as well as to nurture the presentation and discussion skills. Specific topics include the numerical methods for dynamic behavior of thin-walled structures and composite/functional materials, and advanced experimental techniques for structural health monitoring.

Grading   Grading is based on the literature survey, presentation, discussion and the final report.

Course Goals   The goal is to nurture the skills to survey and discuss advanced topics in the mechanics of functional materials and structures as well as structural health monitoring, and to utilize them in carrying out the research project.

Course Topics

Theme	Class number of times	Description
Subject setting	3	Literature survey is to be carried out for advanced topics in the mechanics of functional materials and structures as well as structural health monitoring.
Presentation and discussion	11	The results of literature survey are presented and discussed with the critical evaluations for them.
Assessment	1	The achievement is assessed by the final report.

Textbook   No textbooks are assigned.

Textbook(supplemental)

Prerequisite(s)   Enrolling students are expected to have the fundamental knowledge of solid mechanics and to be willing to work on advanced topics in the mechanics of solids/structures.

Independent Study Outside of Class   Enrolling students are expected to carry out the literature survey and to prepare the presentation.

Web Sites

Additional Information   The time units of each stage are subject to change depending on each year's conditions and due to the discussion by Instructors/students.

Theory of Symbiotic Systems

Code   693518   Course Year   Doctor Course   Term   2nd term   Class day & Period   Mon 4th

Location   Integrated Research Bldg.-213   Credits 2   Restriction No Restriction   Lecture Form(s) Lecture

Language   Japanese   Instructor   ,,,

Course Description   Various theories on developing and maintaining harmonious symbiosis among humans, artifacts, and environments are lectured and discussed. Topics include typical forms of harmonious coexistence such as in ecological systems, caring and artistic nature of communication and interactions, philosophical discussions on deep-ecology, and methodologies for designing symbiotic systems.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

693510

Control Theory for Mechanical Systems

Code   693510   Course Year   Master Course   Term   1st term   Class day & Period   Mon 2nd

Location   Engineering Science Depts Bldg.-315   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory of Human-Machine Systems

Code 693513 Course Year Master Course Term 2nd term Class day & Period Mon 3rd Location

Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese Instructor ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Dynamical Systems,Advanced

Code   693431   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 4th

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Mathematical Analysis,Advanced

Code   693410   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 3rd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Topics in Nonlinear Dynamics A

Code   693320   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   Integrated Research Bldg.-111   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Topics in Nonlinear Dynamics B

Code 693321   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits   Restriction   Lecture Form(s)   Language Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

653316

Heat Engine Systems

Code 653316   Course Year Master Course   Term 2nd term   Class day & Period Tue 3rd   Location

Credits 2   Restriction   Lecture Form(s) Lecture   Language Japanese   Instructor ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Combustion Science and Engineering

Code   653322   Course Year   Master Course   Term   1st term   Class day & Period   Tue 1st   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Meteorology I

Code   10M226   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Meteorology II

Code   10M227   Course Year   Master Course   Term   1st term   Class day & Period   Wed 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to Advanced Nuclear Engineering

Code   10C072   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Nuclear Energy Conversion and Reactor Engineering

Code   10C034   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   KAWARA,KUNUGI,YOKOMINE,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C038

Physics of Fusion Plasma

Code   10C038   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 3rd

Location   C3-Lecture Room 5   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Multiphase Flow Engineering and Its Application

Code 10C037 Course Year Master and Doctor Course Term 2nd term Class day & Period Wed 2nd Location
Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese
Instructor KUNUGI, Tomoaki,YOKOMINE, Takehiko,

Course Description Reviewing of the fundamental definition and characteristics of multiphase flows, and to learn the governmental equations and some modelings of the constitutive equations and the current status of the multiphase flows. Moreover, to review and learn the fundamental definition and characteristics of particle flows, and to learn the numerical methods to track the particle laden flows and the particle measurement method.

Grading Present a summary of some papers regarding multiphase flows research by using a power point, and then answer several questions made by lecturers. The quality of your presentation and how deep understand your subject are the grading point.

Course Goals As for the multiphase flows, to learn its fluid dynamics behaviors, governing equations and numerical methods, and finally to discuss its applications to many engineering fields.

Course Topics

Theme	Class number of times	Description
What's the multiphase flows?	1	To review the definitions and fundamental characteristics of multiphase flows.
Governing equation of gas-liquid two phase flows	2	To learn the governing equation of gas-liquid two phase flows
Modeling of gas-liquid two phase flows	2	To learn modeling of gas-liquid two phase flows and its constitutive equations
Numerical methods	3	To learn the numerical methods to solve the single-phase and two-phase flows
Examples of gas-liquid two phase flow analysis	1	To show some examples of gas-liquid two phase flow analysis
Characteristics of particle flows	1	Review characteristics of particle flows
Fundamental aspect of particle flows	1	Explain variables and parameters subjected to interaction between particle and particle and/or particle and flow. Moreover, momentum and heat exchange between phases, i.e., to explain One-way, Two-way and Four-way coupling numerical methods.
Particle methods	2	Explain numerical method for thermofluid including static particles like a packed bed. Moreover, numerical methods for macroscopic and microscopic particles such as Discrete Element Method.
Measurements of particle characteristics	2	Review several measuring methods of particle characteristics and thermofluid behaviors

Textbook Handouts of the presentation will be provided in the lecture.
Textbook(supplemental)
Prerequisite(s)
Independent Study Outside of Class
Web Sites
Additional Information

Nonlinear Physics in Fusion Plasmas

Code   10R013   Course Year   Doctor Course   Term   1st term   Class day & Period   Tue 3rd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English   Instructor   Atsushi Fukuyama,

Course Description   This course provides a comprehensive introduction to computational modeling and simulation of magnetically confined fusion plasmas. Topics include elements of nonlinear plasma physics, modeling of various phenomena in fusion plasmas, computational methods in plasma physics, and integrated simulation of fusion plasmas

Grading   Report in English

Course Goals

Course Topics

Theme	Class number of times	Description
Nonlinear Phenomena in Plasma Physics	1	Review of nonlinear phenomena in plasmas; modeling of plasmas
Nonlinear Waves in Plasmas	2	Nonlinear ion acoustic waves; Korteweg de Vries equation; Soliton; Nonlinear Schrodinger equation
Wave-Particle Interaction in Plasmas	2	Linear wave particle resonant interaction; Landau damping; Trapping in a single wave: Nonlinear interaction with waves; Stochastic particle motion; Quasi-linear interaction
Wave-Wave Interaction in Plasmas	2	Parametric instability; Three-wave interaction
Numerical Analysis of Differential Equations	4	Basics of numerical simulations; Ordinary differential equation; Partial differential equation; Matrix solver
Numerical Simulation of Fusion Plasmas	3	Numerical simulation of fusion plasmas: equilibrium, transport, heating and current drive, stability, energetic particles, integrated modeling
Assessment of Achievement	1	Assessment of Achievement

Textbook   None

Textbook(supplemental)

Prerequisite(s)   Plasma Physics, Fundamental Magnetohydrodynamics, Fusion Plasma Physics, or equivalents

Independent Study Outside of Class

Web Sites

Additional Information

Bridge Engineering

Code   10F010   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 3rd   Location   C1-172   Credits   2
Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English
Instructor   Hiromichi Shirato, Kunitomo Sugiura, Tomomi Yagi, Masahide Matsumura
 Course Description   The subject matter of bridge engineering can be divided into two main parts, which are steel structure and wind loading/wind resistant structure. The aim of this course is to provide details of mechanical behaviors, maintenance and design of bridge structures. The former part of this course contains the static instability of steel structures and the problems of corrosion   fatigue   brittleness   weldability on steel bridges. In the latter part, the basics of wind engineering, bridge aerodynamics and wind-resistant design   including current problems to be solved are provided are provided.
 Grading   Assessment will be based on exam, reports and participation.
 Course Goals
 Also, the basic knowledge for wind engineering and aerodynamic instabilities, which are necessary for the wind resistant design of bridges, will be acquired.
 Course Topics

Theme	Class number of times	Description
Introduction	1	- Fundamental knowledge on steel structures - Types of steel structures - Future trend of steel structures
Material behavior, Initial imperfections and Damages	1	- Construction of steel structures - Residual stresses and initial deformations - Damages
Stress-strain relationship, Joints	1	- Yield surfaces - Bauschinger effect - Hardening effect - Welded joint - Bolted joint
Fatigue fracture, fatigue life and fatigue design	1	- S-N design curve - Fatigue crack growth, stress intensity factor - Miner's rule on damage accumulation - Repair of fatigue damage
Structural stability and design for buckling	1	- Structural instability and accident - Theory of Stability - Compressive members, etc.
Corrosion and anti-corrosion of steel structures	1	- Mechanism of corrosion - Micro- and Macro- cells - Anti-corrsion - Life-cycle costs
Wind resistant design of structures	3	- Natural winds due to Typhoon, Tornado and so on - Evaluation and estimation of strong winds - Wind resistant design methods - Various kinds of design codes
Aerodynamic instabilities of structures	3	- Introduction of aerodynamic instabilities (ex. vortex-induced vibration, galloping, flutter, buffeting, cable vibrations) - Mechanisms of aerodynamic instabilities - Evaluation methods and Countermeasures
Wind-induced disaster	1	- Accidents on structures due to strong winds - Disaster prevention
Topics	1	Introduction of current topics on bridge engineering by a visiting lecturer
Confirmation of the attainment level of learning	1	Confirm the attainment level of learning

 Textbook
 Textbook(supplemental)
 Prerequisite(s)   Basic knowledge for construction materials, structural mechanics and fluid mechanics are required.
 Independent Study Outside of Class
 Web Sites
 Additional Information

Structural Design

Code   10F009   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 2nd

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Yoshiaki Kubota,Yoshikazu Takahashi,Masahide Matsumura

Course Description   This course provides the knowledge of the structural planning and design for civil infrastructures. Fundamentals of the reliability of structures based on the probability and statistics are given. Emphasis is placed on the reliability index and the calibration of partial safety factors in the LRFD design format. Furthermore, the relationship between structure and form is discussed with various examples.

Grading   Assessed by term-end examination, reports and quizes

Course Goals   To understand the structural planning and design for civil infrastructures.

To understand the reliability-based design of structures.

To deepen the understanding of the relationship between structure and form.

Course Topics

Theme	Class number of times	Description
Structural Planning	2	Structural Planning of civil infrastructures is introduced. The concept, significance of planning, characteristics of civil infrastructures are discussed. Practical planning process of a bridge is explained.
Structure and Form	3	The bridge types such as girder, truss, arch and suspension bridge that have been regarded individually are explained as an integrated concept from the viewpoint of acting forces to understand the structural systems which have continuous or symmetrical relationships. Furthermore, various examples are discussed based on the understanding of the structural systems.
Structural Design and Performance-based Design	3	Design theory of civil infrastructures is introduced. The allowable stress design method and the limit state design method are explained. The basic of earthquake resistant design is discussed based on the dynamic response of structures. Performance-based design is also introduced.
Random Variables and Functions of Random Variables	1	Fundamentals of random variables, functions of random variables, probability of failure and reliability index in their simplest forms are lectured.
Structural Safety Analysis	3	Limit states, probability of failure, FOSM reliability index, Hasofer-Lind reliability index, Monte Carlo method are lectured.
Design Codes	2	Code format as Load and Resistance Factors Design (LRFD) method, calibration of partial safety factors based on the reliability method are given.
Assessment of the Level of Attainment	1	Assess the level of attainment.

Textbook   Reliability of Structures, A. S. Nowak & K. R. Collins, McGraw-Hill, 2000

Textbook(supplemental)   U.Baus, M.Schleich, "Footbridges", Birkhauser, 2008   Japanese ver.:

"Footbridges"(translated by Kubota, et al.),   , 2011

                ,   ,   , 2010

Other books will be given in the lectures as necessary.

Prerequisite(s)   Fundamental knowledge on Probability and Statistics, and Structural Mechanics

Independent Study Outside of Class   N/A

Web Sites

Additional Information   Structural planning and design will be given by Y. Takahashi, Structure and form by Y. Kubota, and Structural reliability analysis by M. Matsumura.

Infrastructural Structure Engineering

Code   10W001   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Relay Lecture

Language   English   Instructor   Related Faculty members,

Course Description   Structural engineering problems related to planning, design, construction and maintenance of the infrastructures are discussed. Topics concerning structural engineering and management are widely taken up including latest advanced knowledge and technology, future view and/or international topics. Special lectures by extramural lecturers are carried out if necessary.

Grading   Coursework will be graded based on the reports.

Course Goals   To grasp problems related to structural engineering and their specific solutions.
To understand applicability of advanced technologies and development prospects.

Course Topics

Theme	Class number of times	Description
Structural Materials, Structural Mechanics	4	Steel materials, Concrete materials, mechanical behavior of structures, Problems related to design, construction and maintenance
Applied Mechanics	1	Numerical analysis for structure performance evaluation
Earthquake and Wind Resistance of Structures	7	Infrastructure and natural disaster, Trends of disaster prevention technology, Problems related to Earthquake and wind resistant design
Maintenance of structure	3	International technology, Scenario design, International technological education and collaboration

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

Textbook(supplemental)   Supplemental text books will be introduced by instructors.

Prerequisite(s)   Structural Mechanics, Wind Resistant Design, Construction Materials, Dynamics of Structures, etc.

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Exercise in Applied Mechanics A

Code   10W005   Course Year   Doctor 1st   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Exercise in Applied Mechanics B

Code   10W007   Course Year   Doctor 1st   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Exercise in Applied Mechanics C

Code   10W009   Course Year   Doctor 2nd   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Exercise in Applied Mechanics D

Code   10W011   Course Year   Doctor 2nd   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W013

Advanced Exercise in Applied Mechanics E

Code   10W013   Course Year   Doctor 3rd   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Exercise in Applied Mechanics F

Code   10W015   Course Year   Doctor 3rd   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Internship M

M

Code   10W019   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Exercise   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Internship DS

DS

Code   10W021   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Exercise   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Internship DL

DL

Code 10W023 Course Year Doctor Course Term 1st+2nd term Class day & Period Location

Credits 6 Restriction Lecture Form(s) Exercise Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar of Complex Mechanical Engineering,A

Code   10V025   Course Year   Doctor Course   Term   1st term   Class day & Period   Fri 1st

Location   C3-Lecture Room 2   Credits   1   Restriction   No Restriction   Lecture Form(s)   Seminar

Language   English   Instructor   Matsuno, Ide, Matsumoto, Takata, Suzuki,

Course Description   This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

Grading   Based on Group Activity Reports and Personal Report

Course Goals

Course Topics

Theme	Class number of times	Description
Self introduction	1-2	
Organizing groups	1	
Group activity	10-12	Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation	1-2	Each group gives presentation of its final resutls.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   All activities should be done in English.
Registration is required by the deadline. Contact at
cme-seminar@me.kyoto-u.ac.jp

Seminar of Complex Mechanical Engineering,B

Code   10V027   Course Year   Doctor Course   Term   2nd term   Class day & Period   Thu 1st

Location   C3-Lecture Room 2   Credits   1   Restriction   No Restriction   Lecture Form(s)   Seminar

Language   English   Instructor   Matsuno, Ide, Matsumoto, Takata, Suzuki,

Course Description   This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

Grading   Based on Group Activity Reports and Personal Report

Course Goals

Course Topics

Theme	Class number of times	Description
Self introduction	1-2	
Organizing groups	1	
Group activity	10-12	Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation	1-2	Each group gives presentation of its final resutls.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   All activities should be done in English.
Registration is required by the deadline. Contact at
cme-seminar@me.kyoto-u.ac.jp

Seminar of Complex Mechanical Engineering,C

Code   10V029   Course Year   Doctor Course   Term   1st term   Class day & Period   Fri 1st

Location   C3-Lecture Room 2   Credits   1   Restriction   No Restriction   Lecture Form(s)   Seminar

Language   English   Instructor   Matsuno, Ide, Matsumoto, Takata, Suzuki,

Course Description   This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

Grading   Based on Group Activity Reports and Personal Report

Course Goals

Course Topics

Theme	Class number of times	Description
Self introduction	1-2	
Organizing groups	1	
Group activity	10-12	Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation	1-2	Each group gives presentation of its final resutls.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   All activities should be done in English.
Registration is required by the deadline. Contact at
cme-seminar@me.kyoto-u.ac.jp

Seminar of Complex Mechanical Engineering,D

Code   10V031   Course Year   Doctor Course   Term   2nd term   Class day & Period   Thu 1st

Location   C3-Lecture Room 2   Credits   1   Restriction   No Restriction   Lecture Form(s)   Seminar

Language   English   Instructor   Matsuno, Ide, Matsumoto, Takata, Suzuki, Ikeda,

Course Description   This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

Grading   Based on Group Activity Reports and Personal Report

Course Goals

Course Topics

Theme	Class number of times	Description
Self introduction	1-2	
Organizing groups	1	
Group activity	10-12	Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation	1-2	Each group gives presentation of its final resutls.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   All activities should be done in English.
Registration is required by the deadline. Contact at
cme-seminar@me.kyoto-u.ac.jp

Seminar of Complex Mechanical Engineering,E

Code   10V033   Course Year   Doctor Course   Term   2nd term   Class day & Period   Thu 1st

Location   C3-Lecture Room 2   Credits   1   Restriction   No Restriction   Lecture Form(s)   Seminar

Language   English   Instructor   Matsuno, Ide, Matsumoto, Takata, Suzuki,

Course Description   This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

Grading   Based on Group Activity Reports and Personal Report

Course Goals

Course Topics

Theme	Class number of times	Description
Self introduction	1-2	
Organizing groups	1	
Group activity	10-12	Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation	1-2	Each group gives presentation of its final resutls.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   All activities should be done in English.
Registration is required by the deadline. Contact at
cme-seminar@me.kyoto-u.ac.jp

Seminar of Complex Mechanical Engineering,F

Code   10V035   Course Year   Doctor Course   Term   2nd term   Class day & Period   Thu 1st

Location   Engineering Science Depts Bldg.-215   Credits   1   Restriction   Lecture Form(s)   Seminar

Language   English   Instructor   Matsuno, Ide, Matsumoto, Takata, Suzuki, Ikeda,

Course Description   This seminar provides doctor-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multi-disciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

Grading   Based on Group Activity Reports and Personal Report

Course Goals

Course Topics

Theme	Class number of times	Description
Self introduction	1-2	
Organizing groups	1	
Group activity	10-12	Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation	1-2	Each group gives presentation of its final resutls.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   All activities should be done in English.

Structural Testing Technology

Code 10W017   Course Year Master and Doctor Course   Term   Class day & Period Summer vacation period   Location Structural testing laboratory

Credits 2   Restriction No Restriction   Lecture Form(s) Exercise   Language Japanese   Instructor Hiromichi SHIRATO,Kunitomo SUGIURA,et al.,

Course Description   The structural design method is going to shift to the performance based design. Since applications of new construction methods and new technology can be accelerated by the use of performance based design, it is necessary to evaluate the performance of structures by the material and structural tests. In this class, the various test methods under static and dynamic loading will be discussed including shaking table test, wind tunnel test and nondestructive evaluation. Instrumentation to measure strain, force, acceleration, temperature and other physical state variables is also discussed through the course work.

Grading   Grade is given based on attendance and reports.

Course Goals   To carry out the structural performance evaluation by material test and structural test based on fundamental understanding of measurement of strain, deflection and vibration in conjunction with the development of design methodology, computing technology, electronics and instrumentations.

Course Topics

Theme	Class number of times	Description
Introduction	1	Physical modeling in structural engineering -Modeling process -Modeling case studies
Dimensional analysis	1	Dimensional analysis for structural models -Similitude requirements(general) -Elastic model -Inelastic model
Instrumentation	2	Data acquisition -Strain -Displacement -Stress and Force -Acceleration -Temperature -Crack detection -Smart structures
Loading system	2	-Loading apparatus -Hydraulic system -Computer control -Loading techniques
Material test	3	-Universal testing machine -Fatigue testing machine -Stress vs. strain relation
Structural testing	3	-Static loading test -Hybrid loading test -Considerations in testing
Shaking table test	1	-Structural models for seismic loading -Similitude requirements -Considerations in shaking table test
Wind tunnel test	1	-Structural models for wind loading -Similitude requirements -Considerations in wind tunnel test
Nondestructive evaluation	1	-Strain measurement -Ultrasonic test -Magnetic particle test -Infrared test

Textbook

Textbook(supplemental)   introduced if necessary

Prerequisite(s)   Knowledge on construction materials, structural mechanics, structural dynamics, instrumentation engineering are required.

Independent Study Outside of Class

Web Sites

Additional Information

10V037

Advanced Experiment and Exercise in Applied Mechanics I, II

Code   10V037   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Experiment and Exercise in Applied Mechanics I, II

Code   10V039   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W201

Developmental and Sustainable Infrastructure Engineering Seminar A
A

Code   10W201   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	30	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Developmental and Sustainable Infrastructure Engineering Seminar B

B

Code 10W203 Course Year Master Course Term 1st+2nd term Class day & Period Location

Credits 4 Restriction Lecture Form(s) Seminar Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	30	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Infrastructural Structure Engineering

Code   10W001   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Relay Lecture

Language   English   Instructor   Related Faculty members,

Course Description   Structural engineering problems related to planning, design, construction and maintenance of the infrastructures are discussed. Topics concerning structural engineering and management are widely taken up including latest advanced knowledge and technology, future view and/or international topics. Special lectures by extramural lecturers are carried out if necessary.

Grading   Coursework will be graded based on the reports.

Course Goals   To grasp problems related to structural engineering and their specific solutions.
To understand applicability of advanced technologies and development prospects.

Course Topics

Theme	Class number of times	Description
Structural Materials, Structural Mechanics	4	Steel materials, Concrete materials, mechanical behavior of structures, Problems related to design, construction and maintenance
Applied Mechanics	1	Numerical analysis for structure performance evaluation
Earthquake and Wind Resistance of Structures	7	Infrastructure and natural disaster, Trends of disaster prevention technology, Problems related to Earthquake and wind resistant design
Maintenance of structure	3	International technology, Scenario design, International technological education and collaboration

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

Textbook(supplemental)   Supplemental text books will be introduced by instructors.

Prerequisite(s)   Structural Mechanics, Wind Resistant Design, Construction Materials, Dynamics of Structures, etc.

Independent Study Outside of Class

Web Sites

Additional Information

10F065

Hydraulic Engineering for Infrastructure Development and Management

Code   10F065   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 3rd
Location   C1-117   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English
Instructor   Hosoda Takashi, Toda Keiichi, Gotoh Hitoshi, Tachikawa Yasuto, Kisihida Kiyoshi, Ichikawa Yutaka,
Harada Eiji, Sanjou Michio, Khayyer Abbas and Kim Sunmin,

 Course Description   This lecture picks up various water-related problems and provides their explanation and
solution methodology related to hydrodynamic and hydrological infrastructure improvements, maintenance,
disaster prevention against flood and damage of water environment, interweaving several leading-edge cases in the
real world. Turbulent flow and CFD, sediment transport system and design/planning of hydraulic structure are
described on the basis of the integrated management of river-and-coast systems with sediment control and these
relationship with infrastructure improvement. Perspective from the viewpoint of public environmental
infrastructure on water environment is presented.

 Grading   Grading is based on students activities in lectures and reports.

 Course Goals   Students learn about case-based practical solutions against various problems related to hydraulic
engineering, and students acquire academic preparation of how to approach to public environmental infrastructure
on water area.

 Course Topics

Theme	Class number of times	Description
Introduction	1	The purpose and constitution of the lecture, the method of the scholastic evaluation are explained.
Hydraulics in open-channel flows	3	Several problems and exciting topics related to hydraulics in open-channel flows are discussed with advanced practical examples.
River basin management	3	Introduction of flood disasters during a few decades in the world, flood control planning in Japan, Economic evaluation and analysis of people's awareness to river improvement projects with dam construction.
Beach erosion	3	Several problems and their solution methodology against sediment transport process in coastal zone are explained. Advanced approaches for sediment control are overviewed.
Rainfall-runoff prediction and hydrologic design	3	Water resources issues related to rainfall-runoff prediction and hydrologic design are discussed with advanced practical examples.
Numerical simulation for Hydraulic engineering	1	Recent numerical simulation development and related state-of-the-art technologies are overviewed.
Achievement Confirmation	1	Comprehension check of course contents.The exercises to the given subjects are performed.

 Textbook   Non

 Textbook(supplemental)   Non

 Prerequisite(s)   hydraulics, fluid mechanics, river engineering, coastal engineering, hydrology, etc.

 Independent Study Outside of Class

 Web Sites   Non

 Additional Information   Non

Resources Development Systems

Code 10A402 Course Year Master and Doctor Course Term 2nd term Class day & Period Fri 1st
Location C1-172 Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese
Instructor S. Murata,

Course Description Development of mineral resources and energy resources is essential to the sustainable development of our society. In this class, the exploration and development process of natural resources are reviewed including the problems of environmental conservation. In addition, petrophysics and its application to the resources exploration and fundamentals of reservoir engineering used for evaluating the production behavior and reserves of oil and natural gas are lectured.

Grading Evaluation is made by the average score of the report problems presented by each teacher.

Course Goals The goal of this class is to master the fundamentals of petrophysics and reservoir engineering needed for the exploration and development of oil and natural gas resources.

Course Topics

Theme	Class number of times	Description
From exploration to development of natural resources	1	The exploration and development process of mineral resources and energy resources, which are essential to the sustainable development of our society, is reviewed including the environmental conservation.
Petrophysics used in natural resources development	2	To know the elastic properties of sedimentary rocks is essential when we consider the exploration and development of oil and natural gas resources. For the sedimentary rocks, physical variables, a rule of thumb and the pore fluid that affect the elastic wave velocity are mainly lectured. For igneous rocks, in addition, the rule of thumb on the physical properties of the rocks affected by fractures are lectures, because fractures in the rocks defines their physical properties.
Fundamentals of reservoir engineering	3	The properties of reservoir fluids and the material balance method to evaluate the reserve of oil and natural gas are explained.
Fluid flow in the reservoir	7	Basic equations of fluid flow in the reservoir and the analytical solution for the flow of oil and natural gas around a well are explained, and the concept and the method of well test analysis are also explained.
Enhanced oil and natural gas recovery	2	The methods of enhanced oil and natural gas recovery (EOGR) are overviewed. The essentials of each EOGR method are explained.

Textbook Handouts are delivered.

Textbook(supplemental) L.P.Dake, Fundamentals of Reservoir Engineering, Developments in petroleum science Vol.8, Elsevir, ISBN 0-444-41830-X

G.Mavko, T. Mukerji and J. Dvorkin, The rock physics handbook :tools for seismic analysis in porous media, Cambridge University Press, ISBN 0-52l-62068-6

Prerequisite(s) It is desirable to have knowledge of calculus at the undergraduate level

Independent Study Outside of Class

Web Sites Web page of this lecture is not specifically provided. When preparing it by need, the information is shown in the class.

Additional Information Not specified

Environmental Risk Analysis

Code   10F439   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 4th
Location   C1-192   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English
Instructor   Yoneda, Takano, Matsuda, Shimada, Matsui,

Course Description   Paying attention to the environment of children in particular, students themselves study, make presentation, and debate about the environmental risk. Students learn the backgound, the actual situation, and the theory for quantitative risk analysis through practice of investigation and discusion by themselves.

Grading   Grading based on the participation and performance in presentation and discussion.

Course Goals   To understand or master the necessity of environmental risk analysis, its practical examls, framework for solving problems concerning to risk evaluation, technical and basic knowledge for environmental risk analysis, and the way of thinking for risk analysis

Course Topics

Theme	Class number of times	Description
Introduction Framework of risk analysis	2	Introduction of lecture and grading. Framework of risk analysis for children of WHO.
Children and health risk	1	1) Why children 2) Children are not little adults
Children and environmental change	1	3) The paediatric environmental and health history 4) Global change and children
Air pollution	1	5) Outdoor air pollution 6) Indoor air pollution
Lead and pesticide	1	7) Pesticides 8) Lead
Heavy metal	1	9) Mercury 10) Other heavy metals
Various risk	1	11) Noise 12) Water 13) Food safety
Chemicals	1	14) Children and chemicals 15) Persistent Organic Pollutants
Tobacco and natural toxin	1	16) Second-hand tobacco smoke 17) Mycotoxins, plants, fungi and derivates
Occupational risk and radiation	1	18) Injuries 19) Ionizing and non-ionizing radiations 20) Occupational risks
Respiratory diseases and cancer	1	21) Respiratory diseases 22) Childhood cancer
Innume disorders and neural system	1	23) Immune disorders 24) Neurobehavioral and neurodevelopmental disorders
Endocrine system and environmental monitoring	1	25) Endocrine disorders 26) Bio-monitoring and environmental monitoring
evelopmental toxicity and indicators	1	27) Early developmental and environmental origins of disease 28) Indicators

Textbook   Necessary files are supplied.

Textbook(supplemental)   To be introduced if necessary.

Prerequisite(s)   Not necessary in particular.

Independent Study Outside of Class

Web Sites

Additional Information   The contents may be changed according to the progress of lecture.

Optimum System Design Engineering

Code   10G403   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Developmental and Sustainable Infrastructure Internship A

ORT   A

Code   10W209   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 5th

Location   C1-173   Credits   2   Restriction   Lecture Form(s)   Exercise   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W211

Developmental and Sustainable Infrastructure Internship B

ORT   B

Code   10W211   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 5th

Location   C1-117   Credits   4   Restriction   Lecture Form(s)   Exercise   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Developmental and Sustainable Infrastructure Engineering Seminar I

Code   10W213   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	30	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W215

Developmental and Sustainable Infrastructure Engineering Seminar II
II

Code   10W215   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	30	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Code   10W215   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Continuum Mechanics

Code 10F003   Course Year Master and Doctor Course   Term 1st term   Class day & Period Mon 2nd   Location C1-192
Credits 2   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese
Instructor   Kunitomo Sugiura, Tomomi Yagi,

Course Description   Continuum mechanics is a unified basis for solid mechanics and fluid mechanics. The aims of this course are to introduce the continuum mechanics from their basics to the some forms of constitutive law and also to provide students with mathematical way of understanding the continuum mechanics. This course contains the fundamentals of vector and tensor calculus, the basic equations of continuum mechanics, the tensor expressions of elastic problems and further applications.

Grading   Assessment will be based on exam, report and participation.

Course Goals   Fundamental theorems on structural mechanics and design will be learned, and ability to judge the proprieties of each computational structural analysis will be acquired.

Course Topics

Theme	Class number of times	Description
Introductions	1	- Outline of Structural Analysis - Mathematical Preliminaries(Vectors and Tensors)
Matrices and tensors	1	- Summation Convention - Eigenvalues and Eigenvectors
differential and integral calculus of tensors	1	- Quotient Laws - Divergence Theorem
Kinematics	1	- Material Description - Spatial Description - Material derivative
Deformation and strain	2	- Strain tensors - Compatibility conditions
Stress and equilibrium equation	1	- Stress Tensors - Equilbrium Equations
Conservation law and governing equation	1	- Conservation of Mass - Conservation of Linear Momentum - Conservation of Energy
Constitutive equation of idealized material	1	- Perfect Fluid - Linear Elastic Material(Isotropic)
Elastic-plastic behavior and constitutive equation of construction materials	1	- Yield Criteria - Flow Rule - Hardening Rule
Boundary value problem	1	- Governing Equations and Unknowns - Navier-Stokes Equation - Navier Equation
Variational principle	1	- Principle of Virtual Work - Principle of Complementary Virtual Work
Various kinds of numerical analyses	2	- Weighted Residual Method - Finite Element Method
Confirmation of the attainment level of learning	1	Feedback based on the Final Examination

Textbook

Textbook(supplemental)

Prerequisite(s)   Basic knowledge for structural mechanics, soil mechanics and fluid mechanics are required.

Independent Study Outside of Class   As appropriate, the assignments are given based on the content of Lecture.

Web Sites

Additional Information

10F067

Structural Stability

Code   10F067   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   C1-171   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Hiromichi SHIRATO, Kunitomo SUGIURA,

Course Description   Fundamental concept of static and dynamic stability of large-scale structures such as bridges is to be introduced in addition to the way to keep/improve their safety and to evaluate their performance. Basic concept of structural stability and its application and technical subjects to improve safety will be lectured systematically. Furthermore, the practical solutions to the subjects are to be introduced to assure the safety of structures.

Grading   Grading will be evaluated by written examination, reports and attendance.

Course Goals   The class aims to cultivate the understanding of static and dynamic stability problems for structural system and make understand the methodology to clarify the limit state. To get knowledge on countermeasures to assure the stability which is applicable to practical design and manufacturing will be also required.

Course Topics

Theme	Class number of times	Description
Elastic Stability under Static Loading	7	Stability of Structures and Failures Basis of Structural Stability Elastic Buckling of Columns Elastic Buckling of Beams & Frames Elastic Buckling of Plates Elasto-plastic Buckling Buckling Analysis
Basic theory of dynamic stability and its application	7	The stability around the equilibrium points based on the state equation of motion in which the nonlinearity of external, damping and restring forces are taken into account. Wind-induced vibration of a square prism (Galloping) and 1dof system with nonlinear spring will be introduced as practical examples. Chaotic motion of a pendulum subjected to periodic external force is also explained as an introduction of chaos theory.
Achievement Check	1	Summary and Achievement Check.

Textbook   Not specified.

Textbook(supplemental)   Introduced in class if necessary.

Prerequisite(s)   It is desired for participants to master structural mechanics, continuum mechanics, mathematical analysis as well as vibration theory.

Independent Study Outside of Class

Web Sites   none

Additional Information   none

Material and Structural System & Management

Code   10F068   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd
Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Relay Lecture
Language   English   Instructor   Hirotaka Kawano,Atsushi Hattori,Takashi Yamamoto,

Course Description   With regard to the maintenance of concrete structures, the deterioration prediction procedures in material and structural properties are discussed based on durability and deterioration processes of concrete structures. Repair materials and methods are also introduced. Note: strengthening materials and methods are discussed in Concrete Structural Engineering, provided in the second semester. In the later half of this lecture, structures are focused as groups rather than an individual structure to understand the difference between asset management and maintenance. By taking into consideration the economic aspect and human resources aspect as well as the physical aspect, the flow of the asset management for structures' groups with view points of the life cycle cost and the budget is provided.

Grading   Reports ,presentations and other activities are inclusively considered.

Course Goals   To understand the maintenance for a single structure and the asset management for structures' group.

Course Topics

Theme	Class number of times	Description
1. Outline of maintenance for concrete structures	1	
2. Deterioration mechanisms of concrete structures and deterioration prediction	4	
3. Repair materials and methods for concrete structures	1	
4. Maintenance and asset management	2	
5. Maintenance for structures' group	2	
6. Management for structures' group	2	
7. Presentations and discussions	3	

Textbook   Not specified. Some materials may be provided.

Textbook(supplemental)   Not specified.

Prerequisite(s)   Basic knowledge on Construction Materials and Concrete Engineering.

Independent Study Outside of Class   Check the handouts. Additional studies will also be instructed.

Web Sites

Additional Information   Positive presence in the lecture is expected by joining discussions for example.

Computational Fluid Dynamics

Code   10F011   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 4th

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Satoru Ushijima, Hitoshi Gotoh, Abbas Khayyer

Course Description   Computational Fluid Dynamics (CFD) is largely developed according to the progress of computer technology in recent years. It is the powerful and effective technique to predict the various fluid phenomena, which show the complicated behaviors due to the non-linearity and other conditions. This course provides the dynamics of fluids and eddies as well as the discretization and numerical techniques, such as finite difference, finite volume and particle methods.

Grading   The grading will be based on homework assignments.

Course Goals   Course goal is to understand the basic theory and numerical techniques for CFD.

Course Topics

Theme	Class number of times	Description
computational method for incompressible fluids	7	The course introduces the MAC algorithm, which is generally used for incompressible Newtonian fluids on the basis of finite difference and finite volume methods (FDM and FVM). The outline of numerical methods is also discussed for parabolic, hyperbolic or elliptic partial differential equations, in terms of the numerical stability and accuracy. Homework will be assigned each week.
Particle method - basic theory and improvements	7	To simulate violent flow with gas-liquid interface which is characterized by fragmentation and coalescence of fluid, particle method shows excellent performance. Firstly, basics of the particle method, namely discretization and algorithm, which is common to SPH(Smoothed Particle Hydrodynamics) and MPS(Moving Particle Semi-implicit) methods, are explained. Particle method is superior in robustness for tracking complicated interface behavior, while it suffers from existence of unphysical fluctuation of pressure. By revisiting the calculation principle of particle method, various improvements have been proposed in recent years. In this lecture, the state-of-the-art of accurate particle method is also described.
Feedback	1	Discuss the contents of all classes and assignments. The details will be introduced in the course.

Textbook   No textbook assigned to the course

Textbook(supplemental)   Recommended books and papers will be introduced in the course.

Prerequisite(s)   Basic knowledge of fluid dynamics, continuum mechanics and computational technique

Independent Study Outside of Class

Web Sites

Additional Information

Structural Dynamics

Code   10F227   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 1st
Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese
Instructor   Igarashi,Furukawa

Course Description   This course deals with dynamics of structural systems and related topics, to provide the theoretical basis to deal with the problems of vibration, safety under dynamic loads and health monitoring associated with infrastructures. The students will study the dynamic response, properties of natural modes and methods of eigenvalue analysis for multi-DOF systems. The topics on the numerical time integration schemes, probabilistic evaluation of structural response to random excitation, and dynamic response control techniques for structures are also studied.

Grading   Based on the results of a final examination, plus homework assignments

Course Goals   (1) To aquire the knowledge on theories and principles of analysis of MDOF systems (2) Systematic understanding of frequency-domain structural response analysis (3) Concept of analysis of numerical time integration schemes (4) Understanding of fundamentals of the random vibration theory

Course Topics

Theme	Class number of times	Description
Introduction	1	Fudamental concepts, harmonic motion
Dynamics of Multi-Degree-Of-Freedom Systems	2	Formulation of Eq. of Motion / Lagrange's method / Normal Modes / Modal Analysis / Modeling of System Damping
Frequency-Domain Analysis of System Response	1	Frequency Response Funcs. / Fourier Transform
Numerical Time Integration	2	Formulation / Stability and Accuracy Analysis of Integration
Random Vibration	6	Overview / Probability Theory / Sequence of i.i.d. Random Variables / Concept of Random Processes / Correlation Funcs. / White Noise / Stochastic Differential Eq. / Lyapunov Eq. / Response to White Noise Excitation / Covariance Matrix Approach / Correlation Funcs. of Random Response / Spectral Representation of Random Processes / Spectral Representation of Structural Response / Application
Structural Response Control	2	Active Control / Semi-Active Control
Achievement Evaluation	1	Students' achievements in understanding of the course material are evaluated.

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

Textbook(supplemental)

Prerequisite(s)   Mechanical vibration (undergraduate level), Complex calculus (integration of analytic functions, Fourier transform, etc.), Probability theory, Linear algebra

Independent Study Outside of Class

Web Sites

Additional Information   There will be homework assignments at the end of most of the lectures.

Earthquake Engineering/Lifeline Engineering

Code   10F261   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 4th

Location   C1-191   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Kiyono,Igarashi,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	1	
	1	
	1	
Principles of seismic design of structures	2	Fundamental thories on dynamic response of nonlinear elastoplastic structural systems and representative seismic design principles
Seismic performance of concrete and steel structures	1	Essentials and current issues related to seismic performance and design of RC and steel structures
Seismic response control and seismic retrofit of structures	1	Idea and current issues on seismic isolation, seismic response control techniques for enhancement of seismic performance of structures, and seismic retrofit and rehabilitation of existing structures
	1	
	2	
	1	
	1	
Achievement evaluation	1	Students' achievements in understanding of the course material are evaluated.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seismic Engineering Exercise

Code   10F263   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 4th
Location   C1-192   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture and Exercise
Language   Japanese   Instructor   Sawada, Takahashi, Goto
 Course Description   This course provides the knowledge of simulation methods for earthquake engineering.
Small groups of students are exercised in the prediction of ground motion generated by a specified seismic fault
and the response analysis of structure selected by themselves considering soil-structure interaction.
 Grading   Based on the performance during the course (including homework) and the results of presentation and
reports.
 Course Goals   At the end of this course, students will be required to have a good understanding of: - Prediction
of ground motion generated by a specified seismic fault - Dynamic response analysis of structures and foundation
(linear/nonlinear)
 Course Topics

Theme	Class number of times	Description
Frequency domain analysis	1	Basics of Fourier transformation is introduced.
Modeling of structure - soil system and time domain analysis	1	Equation of motion of SR model is introduced and the integration method of the equation in time domain is explained.
Exercise of linear seismic response analysis	2	Small groups of students are exercised in elastic modeling of structures and linear response analysis in time domain and frequency domain.
Prediction of ground motion by empirical Green's function method	3	Empirical Green's function method is introduced to predict large earthquakes based on observed small earthquakes.
Seismic analysis method of soil	2	Seismic analysis method of layered half-space based on equivalent linearization method is introduced.
Nonlinear seismic analysis method of structures	2	Nonlinear modeling of structures and the integration and iterative methods of the nonlinear equation of motion in time domain are introduced.
Exercise of nonlinear seismic response analysis	3	Small groups of students are exercised in the prediction of ground motion generated by a specified seismic fault and the nonlinear response analysis of structures and foundation.
Achievement Check	1	All students give presentations and discussions.

 Textbook   Not used; Class hand-outs are distributed when necessary.
 Textbook(supplemental)
 Prerequisite(s)   Earthquake Engineering/Lifeline Engineering (10F261), Structural Dynamics (10F227)
 Independent Study Outside of Class   Students require to review and analyze in preparation for final
presentations.
 Web Sites
 Additional Information

10F075

Hydraulics & Turbulence Mechanics

Code   10F075   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 3rd

Location   C1-171   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Toda,Sanjou,Okamoto,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Guidance	1	Guidance and entrance level lecture about fluid dynamics and turbulence
Theories of turbulence	3	Lectures about momentum equation, boundary layer, energy transport, vortex dynamics and spectrum analysis
Turbulence in natural rivers	4	Lectures about diffusion and dispersion phenomena observed in natural rivers.
Vegetation and turbulence	3	Lecture about turbulence transport in vegetation canopy together with introduction of recent researches
Practical topics in natural rivers	2	Lectures about compound channel and sediment transport
Practical topics in hydraulic engineering	2	Lectures about drifting object in flood and fish way

Textbook

Textbook(supplemental)

Prerequisite(s)   Hydraulics

Independent Study Outside of Class

Web Sites

Additional Information

Basin Environmental Disaster Mitigation

Code   10F466   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 3rd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	3	
	3	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10F077

River basin management of flood and sediment

Code   10F077   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 1st

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   (DPRI) Nakagawa, H., (DPRI) Sumi, T., (DPRI) Takebayashi, H. and (DPRI) Kawaike, K.,

Course Description   In a river basin, various kinds of disasters such as debris flow, land slide, flood inundation, storm surge, and etc. sometimes happen from the origin to the mouth. This lecture presents occurrence examples, mechanisms, theory and methods of prediction and prevention/mitigation methods against those disasters. Also this lecture mentions comprehensive management in a sediment routing system focusing on sediment management strategy in dam reservoirs.

Grading   Grading is based on 2 reports out of 4 topics and attendance.

Course Goals   The goals of the class are to understand phenomena within a river basin and to have wide knowledge of problems of flood and sediment disasters and countermeasures against them.

Course Topics

Theme	Class number of times	Description
About Sabo Works	4	About Sabo works, sediment disasters, countermeasures against sediment disasters, Sabo projects.
About Reservoir Sediment Management	3	Reservoir sediment management focusing on reservoir sustainability and comprehensive management in a sediment routing system is overviewed including worldwide perspective and Japanese advanced case studies.
About basin-wide sediment routing	4	About the one dimensional bed deformation analysis and the sediment runoff model are introduced. Furthermore, some examples of the application of those models are introduced.
About basin-wide flood management	4	Flood disasters and countermeasures against them are overviewed along the history of flood management in Japan.

Textbook   No designation. Printed materials regarding the contents of this class are distributed in class.

Textbook(supplemental)   Instructed in class

Prerequisite(s)   Fundamental knowledge of Hydraulics and river engineering

Independent Study Outside of Class

Web Sites

Additional Information   This class is held biennially and is not held in 2014. Attendance is taken every time.

River Engineering and River Basin Management

Code   10F019   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 1st   Location   C1-173

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   Hosoda, Kishida, Onda

Course Description   It is important to consider about rivers comprehensively from the various points of view based on natural & social sciences and engineering & technology. The fundamental knowledge to consider rivers and to make the plans for river basins is explained with the following contents: various view points to consider rivers, long term environmental changes of rivers and its main factors, river flows and river channel processes, the ecological system of rivers and lakes, flood & slope failure disasters, the integrated river basin planning(flood defense, environmental improvement planning, sediment transport system), functions of dam reservoir and management.

Grading   Reports & Attendance

Course Goals   Students are requested to understand the fundamental knowledge to consider rivers and river basins comprehensively from the various points of view based on natural & social sciences and engineering & technology.

Course Topics

Theme	Class number of times	Description
Various view points to consider rivers and river basins	1	Various viewpoints to consider rivers and river basins, Various rivers on the earth, Formation processes of river basins, long term environmental changes of rivers and its main factors
Ecological system in rivers	2	The fundamental knowledge on river ecologycal system
Applications of computational methods to environmental problems	2	The following items are lectured: Computational method to predict river flows and river channel processes with sediment transport and river bed deformation, Hydrodynamics in Lake Biwa.
Recent flood disasters & Integrated river basin planning	2	Characteristics of recent flood and slope failure disasters, the Fundamental river management plan and the River improvement plan based on the River Law, Procedures to make the flood control planning, Flood invasion analysis and hazard map.
Groundwater and its related field	2	Simulation technology of groundwater, Geo-environmental issues, Reservoir Engineering, Contaminant Transport Processes.
Sustainable development of dam	2	Needs of dam development and history of dam construction, Maintenace of Dam reservoir.
Economic evaluation of environmental improvement projects	1	Evaluation of people's awareness & WTP to river improvement projects by means of CVM, Conjoint Analysis, etc.
Dam structure and maintenance	2	Dam structure, foundation, grouting. Desighn of Arch Dam and Graviety Dam.
Achievement Confirmation and Feedback	1	Comprehension check of course contents (Reports & Quiz)

Textbook   Printed materials regarding the contents of this class are distributed in the class.

Textbook(supplemental)

Prerequisite(s)   Fundamental knowledge of Hydraulics, Hydrology and Ecology

Independent Study Outside of Class

Web Sites

Additional Information   Students can contact with professors by visiting their rooms and sending e-mails.

Prof. Hosoda: hosoda.takashi.4w@kyoto-u.ac.jp

Prof. Kishida: kishida.kiyoshi.3r@kyoto-u.ac.jp

Assistant. Prof. Onda: onda.shinichiro.2e@kyoto-u.ac.jp

Laboratory of Evolutionarily Sustainable Infrastructure Engineering

Sediment Hydraulics

Code 10A040 Course Year Master and Doctor Course Term 1st term Class day & Period Mon 2nd

Location C1-191 Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor Hitoshi Gotoh and Eiji Harada,

Course Description Natural flows in river and coast are movable bed phenomena with the interaction of flow and sediment. At a river and a coast, a current and a wave activate a sediment transport and bring the topographical change of a bed such as sedimentation or erosion. This lecture provides an outline about the basics of sediment (or movable bed) hydraulics, and detail of the computational mechanics of sediment transport, which has been developed on the basis of dynamics of flow and sediment by introducing a multiphase flow model and a granular material model. Furthermore, about sediment and water-environment relationship, some of frontier technologies, such as an artificial flood, removal works of dam sedimentation, coastal protection works, and sand upwelling work for covering contaminated sludge on flow bottom etc., are mentioned.

Grading Grading is based on student's activities in lectures and written examination.

Course Goals Students understand the basics of sediment hydraulics and outline of advanced models for computational sediment hydraulics, such as multiphase flow model and granular material model. Students understand the present conditions of sediment control works.

Course Topics

Theme	Class number of times	Description
Introduction	1	The purpose and constitution of the lecture, the method of the scholastic evaluation are explained.
Basics of sediment hydraulics	5	Physical characteristic of a movable bed and a non-equilibrium sediment transport process and its description are explained. Furthermore, the prediction technique of topographical change due to current and waves is outlined.
Computational mechanics of sediment transport: The state of the art	8	Essential parts of numerical models of the movable bed phenomena, which has been developed by introducing dynamic models such as a granular material model to describe a collision of sediment particles and a multiphase flow model to describe a fluid-sediment interaction, are described. In comparison with the conventional movable bed computation, the points on which has been improved to enhance the applicability of the models are concretely mentioned. Some frontier studies of sediment transport mechanics are also introduced.
Achievement cofirmation	1	Comprehension check of course contents.

Textbook Hitoshi Gotoh: Computational Mechanics of Sediment Transport, Morikita Shuppan Co., Ltd., p.223, 2004 (in Japanese).

Textbook(supplemental) Non

Prerequisite(s) Undergraduate-level Hydraulics or Hydrodynamics is required. Because a commentary easy as possible is kept in mind by lectures, students without these prerequisite are welcomed.

Independent Study Outside of Class Review fundamental items of hydraulics or hydrodynamics.

Web Sites Non

Additional Information Non

Coastal Wave Dynamics

Code   10F462   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 3rd

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Hitoshi Gotoh   Khayyer Abbas, Eiji Harada and Hiroyuki Ikari

Course Description   Wave motion, which is the main driving force in coastal zone, is explained focusing on wave transformation theory and computational fluid dynamics, and design for coastal structures of their engineering applications is illustrated. As for the computational fluid dynamics for waves, methodology of free-surface wave based on the Navier-Stokes equation, which has been significantly developed in recent years, is explained in detail.

Grading   Grading is based on student's activities in lectures and written examination.

Course Goals   Goal of this course is a detailed understanding of fundamental of wave transformation theory and computational fluid dynamics related to wave motion, and is also acquiring a design concept for coastal structures as their engineering applications.

Course Topics

Theme	Class number of times	Description
Introduction	1	The purpose and constitution of the lecture the method of the scholastic evaluation are explained.
Conservation laws of fluid	4	Fundamentals of fluid mechanics, liner / non-liner wave theories and numerical mathematics are explained.
Modeling of surf zone dynamics	6	Several methodologies against free-surface wave including breaking waves (i.e. VOF, MPS, SPH) are illustrated. Especially advanced approaches of MPS and SPH are explained in detail.
Introduction of turbulence models	1	Reynolds averaging models and large eddy simulation are outlined.
Modeling of rock mound dynamics	2	Method for tracking of armor blocks under high waves using Distinct Element Method is described.
Achievement Confirmation	1	Comprehension check of course contents.

Textbook   Computational Wave Dynamics by Hitoshi Gotoh, Akio Okayasu and Yasunori Watanabe 234pp, ISBN: 978-981-4449-70-0

Textbook(supplemental)   Non

Prerequisite(s)   Non. It is desiarable to have knowledge about hydraulics, fluid mechanics.

Independent Study Outside of Class   Review fundamental items of hydraulics or hydrodynamics.

Web Sites

Additional Information   If there are any questions, please send e-mail to the staff. This course will be offered in 2015.

Hydrology

Code   10A216   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 2nd

Location   C1-117   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Yasuto TACHIKAWA, Yutaka ICHIKAWA and Kazuaki YOROZU

Course Description   Physical mechanisms of the hydrologic cycle are described from the engineering viewpoint. The rainfall-runoff modeling and its prediction method are emphasized. Physical hydrological processes explored are surface flow, saturated-unsaturated subsurface flow, streamflow routing, and evapotranspiration. Physical mechanism of each hydrological process and its numerical modeling method are explained. The basic equations and numerical simulation methods are provided. Then, detail of distributed hydrological modeling is explained through exercise.

Grading   Examination and report

Course Goals   The goals of the class are to understand the physical mechanism of hydrological processes, their basic equations, and numerical simulation methods.

Course Topics

Theme	Class number of times	Description
Introduction	1	The hydrologic cycle and the hydrological processes are explained.
Surfaceflow	2	The physical process of the surface flow and its numerical modeling method are described. The basic equations of the surface flow and the numerical simulation methods are explained.
Streamflow routing	2	The physical process of the streamflow routing and its numerical modeling method are described. The basic equations of the streamflow routing and the numerical simulation methods are explained.
Channel network and watershed modeling	1	Numerical representations of channel networks and catchments are explained.
Distributed hydrological model	5	A physically-based distributed hydrological model is described, which is constructed with numerical representations of channel networks and catchments.
Climate change and hydrologic cycle	1	Data analysis of the latest GCM simulation is presented and the impact of climate change on the hydrologic cycle is discussed.
Evapotranspiration	2	The physical process of the evapotranspiration and its numerical modeling method are described. The basic equations of the evapotranspiration and the numerical simulation methods are explained.
Feedback of study achievement	1	Feedback of study achievement is conducted.

Textbook   Handouts are distributed at each class.

Textbook(supplemental)

Prerequisite(s)   Basic knowledge of hydraulics and hydrology

Independent Study Outside of Class   Read the textbook and/or related documents in advance and work on assignments to improve understanding of the lecture contents.

Web Sites   http://hywr.kuciv.kyoto-u.ac.jp/lecture/lecture.html

Additional Information   This course is open in English every other year. In 2016, the course will be open.

Hydrologic Design and Management

Code   10F464   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd
Location   C1-191   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese
Instructor   Yasuto TACHIKAWA and Yutaka ICHIKAWA

Course Description   Hydrologic design and real-time rainfall-runoff prediction methods are described. The frequency analysis of hydrologic extreme values and the time series analysis of hydrologic variables are described, and then a procedure to determone an external force for the hydrologic design are explained. Next, a physically based hydrologic model which includes various processes of human activities for the hydrologic cycle is described. A flood control planning and water resources management with the use of innovative hydrologic simulation tools is described. Then, A real-time rainfall runoff prediction method with the use of Kalman filter theory is described.

Grading   Final report (100)

Course Goals   The class aims to understand the probabilistic and statistical analysis of hydrologic variables to determine the external force of hydrologic designs, applications of hydrologic simulations for hydrologic designs, and real-time rainfall and runoff prediction methods for water resources management.

Course Topics

Theme	Class number of times	Description
Introduction	1	A flood control planning and water resources planning are introduced.
Frequency analysis and hydrologic design	3	The frequency analysis of hydrologic extreme values is described. The methods to set the external force for the hydrologic design are explained.
Time series analysis and hydrologic design	2	The time series analysis of hydrologic variables is described. The methods to develop time series models, time serried data generation methods, spatiotemporal variation of hydrologic variables and a random field model, disaggregation methods are explained.
Hydrologic modeling and predictive uncertainty	2	Hydrologic models which include the process of human activities for the hydrologic cycle is described. Then, hydrologic predictive uncertainty is explained, which is inevitable coming from model structure uncertainty, parameter identification uncertainty and model input uncertainty. Especially, the relation between spatiotemporal scales of hydrologic modeling and model parameter values is described.
Hydrologic modeling system	2	A hydrologic modeling system which helps to develop complicated hydrologic simulation models and its importance for a flood control planning is also described.
Watershed management for flood disaster	2	Watershed management to mitigate flood disasters is described. A cost-benefit analysis of flood control measures is discussed.
Real-time rainfall runoff prediction	2	A real-time rainfall runoff prediction method with the use of Kalman filter theory and a new filter theory is described.
Feedback of study achievement	1	Feedback of study achievement is conducted.

Textbook

Textbook(supplemental)

Prerequisite(s)   Basic knowledge of hydrology, probability and statistics are required.

Independent Study Outside of Class   Read the textbook and/or related documents in advance and work on assignments to improve understanding of the lecture contents.

Web Sites   http://hywr.kuciv.kyoto-u.ac.jp/lecture/lecture.html

Additional Information

Laboratory of Evolutionarily Sustainable Infrastructure Engineering

Water Resources Systems

Code 10A222 Course Year Master and Doctor Course Term 1st term Class day & Period Tue 1st

Location C1-192 Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor Hori, T.(DPRI) and Tanaka, K.(DPRI)

Course Description Systems approach to natural and social phenomena associated to water resources is introduced in terms of planning and design of sustainable water resources systems.

Grading Grading is done based on examination and commitment to classes.

Course Goals Deep understanding of fundamentals for systems modeling of water-related natural and social processes and ability to perform data collection, analyses and design of sustainable water management systems.

Course Topics

Theme	Class number of times	Description
Optimum design of water resources systems	3	
desicion support for water resources management	3	
Recent topics on water management	1	
Water management practices in the world	3	
Land surface model and its application to water management	4	
achievement check	1	

Textbook Not specified.

Textbook(supplemental) Supplemental documents will be introduced in classes.

Prerequisite(s) Fundamentals of hydrology and water resouyrces engineering.

Independent Study Outside of Class Review work based on handouts and report work for issues given in the classes are required.

Web Sites

Additional Information Open every two years. Not available in 2016.

Coastal and Urban Water Disasters Engineering

Code   10F269   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   C1-192   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   H. Mase,A. Igarashi,N. Yoneyama,Nobuhito Mori,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Out line of coastal and urbarn disasters	1	Introduction of coastal and urban disasters will be lectured. The type and cause of coastal and urban disasters will be explained for sequential lectures.
Modeling of tsunami, storm surge and waves	3	The fundamental physics and governing equations of tsunami, storm surge and ocean waves will be described and applications and historical events will be explained in detail.
Reduction of coastal disasters	3	Characteristics of historical tsunamis, storms surges and coastal erosion will be presented with countermeasures by engineering approaches. Reliability design for coastal structures will be explained following Japanese standard.
Earthquake Disaster in Urban Areas	1	Review of recent earthquake disasters in urban areas in Japan and other counries
Principle of Strucural Design against Disasters	3	Fundamental Principles of safety and performance of structures against extreme events, including earthquakes and tsunami
	1	
	2	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Hydro-Meteorologically Based Disaster Prevention

Code   10F267   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 3rd

Location   C1-191   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Kaoru Takara, Eiichi Nakakita, Takahiro Sayama

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Water Quality Engineering

Code   10F441   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   C1-171   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hiroaki TANAKA,Fumitake NISHIMURA,Naoyuki YAMASHITA,Makoto YASOJIMA,Sei-ichiro OKAMOTO

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Open Channel Hydraulics

Code   10F245   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 1st

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   HOSODA, Takashi and ONDA, Shinichiro

Course Description   Hydraulic engineers and river engineers are requested to understand Open Channel Hydraulics to handle practical problems properly. In this class, the basic theory on open channel hydraulics is lectured showing various applications in Hydraulic Engineering Field. The contents include the following items: Application of a singular point theory to water surface profile analysis, Derivation of 2-D depth averaged flow model, 1-D analysis of unsteady open channel flows based on the method of characteristics, Plane 2-D analysis of steady high velocity flows, Plane 2-D analysis of unsteady flows, Higher order theories such as Boussinesq equation, etc.

Grading   the regular examination

Course Goals   Students are requested to understand the basic theory of Open Channel Hydraulics and to learn how to apply the basic theory to practical problems in hydraulic engineering field.

Course Topics

Theme	Class number of times	Description
Guidance	1	The contents of this subject are introduced showing the whole framework of Open Channel Hydraulics with several theoretical and computational results.
Derivation of 2-D depth averaged model	1	Derivation procesures of plane 2-D depth averaged flow model are expalined in details.
Application of singular point theory to water surface profile analysis	1	The application of a singular point theory to water surface profile analysis for steady open channel flows is explained.
1-D analysis of unsteady open channel flows	3	The following items are lectured: Fundamental characteristics of 1-D unsteady open channel flows, Method of Characteristics, Dam break flows, Computational methods for shallow water equations.
Fundamentals of numerical simulation	1	basic theory of numerical simulation is explained by means of finite difference method, finite element method, etc. Applications of these method to unsteady open channel flow equations are also shown with some practical applications in river engineering.
Plane 2-D analysis of steady high velocity flows	1	Characteristics of steady plane 2-D flows are explained based on the method of characteristics.
Plance 2-D analysis of unsteady flows	3	The following items are lectured: The propagation of a characteristic surface, the shear layer instability in 2-D flow fields, the application of a generalized curvilinear coordinate system to river flow computation, the application of a moving coordinate system, etc.
Higher order theory	3	Boussinesq equation with the effect of vertical acceleration, full/partially full pressurized flows observed in a sewer network, traffic flow theory based on a dynamic wave model and its application
Achievement Confirmation & Feedback	1	Understanding of the contents on Open Channel Hydraulics is confirmed through the regular examination.

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

Textbook(supplemental)

Prerequisite(s)   The Basic knowledge on fluid dyanamics and hydraulics

Independent Study Outside of Class

Web Sites

Additional Information   Students can contact with Hosoda by sending e-mail to hosoda.takashi.4w@kyoto-u.ac.jp.

Applied Hydrology

Code   10F100   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 4th

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Hori(DPRI), Sumi(DPRI), S.Tanaka(DPRI), Takemon(DPRI), K.Tanaka(DPRI), Kantoush(DPRI)

Course Description   Applied and integrated approach to the problems closely related to the water circulation system, such as floods, droughts, water contamination, ecological change, and social change is introduced mainly from the hydrological viewpoint with reference to water quantity, quality, ecological and socio-economic aspects. In the course, several actual water problems are taken up and solving process of each problem which comprises of problem-identification and formulation, impact assessment, countermeasures design and performance evaluation is learned through the lectures' description and also investigation and discussion among the students.

Grading   Grading is based on student activities in lectures, presentation and reports.

Course Goals   To obtain fundamental Knowledge and skills to perform problem definition, survey amd countermeasure design on problems about water use, water hazard mitigation and water environment.

Course Topics

Theme	Class number of times	Description
Water disasters and risk management	2	Risk assessment of water disasters, countermeasures and adaptation design, wataer disasters and human security
Reservoir Systems and Sustainability	2	Reservoir system and its environmental impacts, Sustainable management of reservoir system
Hydrological Frequency Analysis	3	Basic theory and application of Hydrological Frequency Analysis, which is the basis for hydrologic design.
Land Surface Proceses	2	Modelling of land surface processes, Application of land surface model
Hydrological Measurements of Large River Basins	2	Design and management of hydrological measurement system in large river basins
Hydro-eco Systems	2	Ecohydrological management of habitats in river ecosystems, Ecohydrological management of biodiversity in wetland ecosystems
Presentation and Discussion	2	study and exersize for given topics

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

Textbook(supplemental)   None

Prerequisite(s)   Elementary knowledge of hydrology and water resources engineering.

Independent Study Outside of Class   Review work based on handouts and report work for issues given in the classes are required.

Web Sites

Additional Information

Case Studies Harmonizing Disaster Management and Environment Conservation

Code   10F103   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 4th   Location   C1-191
Credits   2   Restriction   No Restriction   Lecture Form(s)   Relay Lecture   Language   English
Instructor   K. TAKARA(DPRI), H. NAKAGAWA(DPRI), E. NAKAKITA(DPRI), H. MASE(DPRI), N. MORI(DPRI), T. SAYAMA(DPRI)

Course Description   Environmental impacts by infrastructure for disaster prevention and mitigation are discussed. Introducing various examples of natural disasters, degradation of the environment, and harmonizing disaster management and environmental conservation in the world, this classroom carries on a dialogue about effective measures for reducing negative environmental impacts and serious disasters.

Grading   Considering both the number of attendances and the score of final test at the end of the semester.

Course Goals   Conservation of the environment and prevention/mitigation of natural disasters, which are very important for human's survivability, often conflict with each other. This course introduces various examples. Students will learn many examples harmonizing these two issues, and shall consider technical and social countermeasures fitting to the regional characteristics.

Course Topics

Theme	Class number of times	Description
Introduction	1	Introduction
Disaster due to heavy rainfall -- utilization of weather radar and global climate change	3	Disaster due to heavy rainfall -- utilization of weather radar and global climate change
Flood disaster prevention and the environment	2	Flood disaster prevention and the environment
River environment and disaster management	3	River environment and disaster management
Hydrological processes and water disaster predictions	2	Hydrological processes and water disaster predictions
Coastal disasters due to tsunamis and storm surges	2	Coastal disasters due to tsunamis and storm surges
Projection of climate and coastal environmental change	2	Projection of climate and coastal environmental change

Textbook   No particular textbook for this course. Necessary documents and literature introduction are provided in the class room from time to time.

Lecture material for "Coastal disasters due to tsunamis and storm surges"
http://urx3.nu/t4sq
http://urx3.nu/t4sA
http://urx3.nu/t4sC

Textbook(supplemental)   Some literature would be introduced by professors.

Prerequisite(s)   No special knowledge and techniques are necessary, but requires reading, writing and discussing in English in the class.

Independent Study Outside of Class   No specific requirement for independent study. Collect information broadly regarding environment and disaster related topics.

Web Sites

Additional Information   Contact Prof. Takara at <takara.kaoru.7v@kyoto-u.ac.jp> if you have any query.

Integrated Disasters and Resources Management in Watersheds

Code   10F106   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 1st

Location   Katsura Campus, Ujigawa Open Laboratory, Shirahama Oceanographic Observatory and Hodaka Sedimentation Observatory

Credits   2   Restriction   Lecture Form(s)   Lecture and Exercise   Language   English

Instructor   Masaharu FUJITA(DPRI), Tetsuya HIRAISHI(DPRI), Nozomu YONEYAMA(DPRI), Kenji KAWAIKE(DPRI), Hiroshi TAKEBAYASHI(DPRI), Daizo TSUTSUMI(DPRI), Yasuyuki BABA(DPRI),

Course Description   Mechanism and countermeasures of sediment disasters, flood disasters, urban flood disasters and coastal disasters are explained. An integrated watershed management of these disasters and water/sediment resources is also introduced. This lecture will be open at Katsura Campus, Ujigawa Open Laboratory, Shirahama Oceanographic Observatory and Hodaka Sedimentation Observatory. Students attending this lecture must take one of the intensive experiment/field study courses offered in Ujigawa Open Laboratory and these observatories.

Grading   Presentation, Discussion and Report

Course Goals   Learn an integrated basin management system for natural disasters (sediment disasters, food disasters, coastal disasters, urban flood disasters) mitigation and water/sediment resources utilization considering environmental conservation.

Course Topics

Theme	Class number of times	Description
Introduction	1	Contents of this lecture are explaned.
Urban flood disaster managemnet	2	We review urban floods from the viewpoint of river basins, flood causes, and features, together with the results of recent studies. Based on these studies, we propose comprehensive measures against urban floods, including underground inundations. In addition, we discuss on prediction methods of the tsunami disaster in urban area.
Flood disaster management	2	Prevention / mitigation measures against flood disasters and flood prediction methods are explained as well as examples of recent flood disasters in Japan.
Sediment disaster management	2	Showing the problems on sediment disasters and sediment resources, I explain an integrated sedimnet management system both for sediment disasters and sediment resources.
Coastal disaster management	2	Coastal erosion and tsunami hazard become remarkable in these days in Japanese coast. In a lecture, we discuss on characteristics of such coastal disasters.
Exercise on flood disaster at Ujigawa Open Laboratory (Selective)		Experiment and analysis on debris flows, riverbed variation and flooding at Ujigawa Open Laboratory, Fushimi-ku, Kyoto city.
Exercise on sediment related disaster at Hodaka Sedimentation Observatory (Selective)		The Hodaka Sedimentation Observatory is located at Okuhida region, Gifu Prefecture. In the field exercise, observation methods of rainfall-runoff and sediment movement processes will be explained. Field investigations into several types of erosion control facilities, sediment producing sites, debris flow sites and sediment related disaster sites will be carried out.
Exercise on coastal disaster at Shirahama Oceanographic Observatory (Selective)		The Shirahama Oceanographic Observatory is located in Shirahama, Wakayama Prefecture. In the lecture, the observatory, waves, currents and tide levels monitoring system is demonstrated as well as the observation tower and the observation boat.

Textbook   None

Textbook(supplemental)   None

Prerequisite(s)   Hydraulics, River Engineering, Coastal Engineering, Sediment Transport Hydraulics

Independent Study Outside of Class

Web Sites

Additional Information

Geomechanics

Code   10F025   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 2nd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Mamoru Mimura,Sayuri Kimoto,

Course Description   Mechanical behavior of soils and problems of its deformation and failure will be covered based on the multiphase mixture theory and the mechanics of granular materials.

Grading   Final examination (70) and hormeworks,class performance (30)

Course Goals   The objectives of this course are to understand the basics of geomechanics, and the advanced theories.

Course Topics

Theme	Class number of times	Description
Deformation of geomaterils	1	Mechanical property of geomaterials, critical state soil mechanics, Failure criteria, modelling of geomaterials (by Prof.Mimura)
Field equations and constitutive model	2	Framework and field equations for contiuum, stress-strain ralations for soils, elastic model, elasto-plastic model, plasticity theory (by Prof.Mimura)
elasto-plastic constitutive model	3	Constitutive model for geomaterials, elasto-plastic model, Cam clay model (by Prof. Mimura)
Theory of viscosity and viscoplasticity	3	Viscoelasticity, viscoplasticity, Elasto-viscoplastic mode, Adachi-Oka model, Microstructure of soils, Temperature dependent behavior, Applications of constitutive models (by Prof. Mimura)
Consolidation analysis	3	Biot's consolidation theory and its application, Consolidation of embankment (by Assoc.Prof. Kimoto)
Liquefaction of soils	2	Liquefaction of sandy soil, Damage and failure due to liquefaction, Remedial measures for liquefaction (by Assoc.Prof. Kimoto)
Confirmation of achievement	1	

Textbook   Handout will be given.

Soil mechanics, Fusao Oka, Asakura Publishing (in Japaneses)

Textbook(supplemental)   An elasto-viscoplastic constitutive model, Fusao Oka, Morikita Publishing (in Japanese)

Prerequisite(s)   Soil mechanics, Fundamentals of continuum mechanics

Independent Study Outside of Class

Web Sites

Additional Information

Computational Geotechnics

Code   10K016   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Language   English

Instructor   ,

Course Description   The course provides students with the numerical modeling of soils to predict the behavior such as consolidation and chemical transport in porous media. The course will cover reviews of the constitutive models of geomaterials, and the development of fully coupled finite element formulation for solid-fluid two phase materials. Students are required to develop a finite element code for solving boundary valueproblems. At the end of the term, students are required to give a presentation of the results.

Grading   Presentation and home works

Course Goals   Understanding the numerical modeling of soils to predict the mechanical behavior of prous media, such as, deformation of two-phase mixture and chemical transportation.

Course Topics

Theme	Class number of times	Description
Guidance and Introduction	1	Fundamental concept in continuum mechanics such as deformation, stresses, and motion.
Governing equations for fluid-soid two-phase materials	2	Motion, conservation of mass, balance of linear momeutum for fluid-solid two-phase materials. Constitutive models for soils, including elasticity, plasticity, and visco-plasticity.
Ground water flow and chemical transport	5	Chemical transport in porous media, advective-dispersive chemical transport.
Boundary value problem, FEM programming	5	The virtual work theorem and finite element method for two phase material are described for quasi-static and dynamic problems within the framework of infinitesimal strain theory. Programing code for consolidation analysis is presented.
Presentation	2	Students are required to give a presentation of the results.

Textbook   Handout will be given.

Textbook(supplemental)

Prerequisite(s)   Fundamental geomechanics and numericalmethods

Independent Study Outside of Class

Web Sites

Additional Information

Geo-Risk Management

Code   10F238   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 4th

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Ohtsu

Course Description   This lecture aims to provide interdisciplinary knowledge associated with geo-risk engineering, the topics of risk analysis focusing on geotechnical structures. In detail, the contents of lectures consist of following topics: Introduction to risk analysis, Mathematical background of geo-risk evaluation, Examples of risk evaluation mainly focusing on slopes and Risk management on road slopes.

Grading   Attendance(10%), Report(30%), Examination(60%)

Course Goals

Course Topics

Theme	Class number of times	Description
Guidance	1	Guidance Introduction of Geo-Asset Management
Basic	4	Basics of Risk Analysis (3)
Probability theory	7	Evaluation of Slope Risk
Case Studies in Asian Countries	2	Natural Disasters in Asian Countries
Feed back	1	Feed back

Textbook   Hiroyasu Ohtsu, Project Management, Corona Publishing, 2010. (in Japanese)

Textbook(supplemental)   C. Chapman and S. Ward, Project Risk Management, John Wiley & Sons, 1997.

R. Flanagan and G. Norman, Risk Management and Construction, Blackwell Science

V.M. Malhotra & N.J. Carino, CRC Handbook on Nondestructive Testing of Concrete, CRC Press, 1989.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Addtional information is available by visiting the following professors. Appointment shall be made in advance by e-mail.

ohtsu.hiroyasu.6n@kyoto-u.ac.jp

Fundamental Geofront Engineering

Code 10F405 Course Year Master and Doctor Course Term 1st term Class day & Period Tue 1st Location C1 Jin-Yu Hall
Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language English
Instructor Prof. Mamoru MIMURA, Prof. Makoto KIMURA, Assoc. Prof. Yosuke HIGO
Course Description This course deals with near-surface quaternary soft soil deposits that are the most important in the engineering sense. Physical properties and the mechanical characteristics of partially saturated and fully saturated soils are explained, and then various problems in terms of disaster prevention and infrastructure construction are discussed.
Grading Performance grading will be provided based on quality of assigned reports and presentations, etc.
Course Goals The aim of this course is to understand engineering problems and their mechanical background in the following points:
- Physical properties and mechanical characteristics of quaternary soft soil deposits and relevant engineering problems in terms of disaster prevention
- Fundamentals of unsaturated soil mechanics and engineering problems of earth structures in terms of disaster prevention
- Concepts of innovative underground foundations and structures and engineering problems during construction
Course Topics

Theme	Class number of times	Description
Outline of the course, introduction to quaternary deposits	1	Introduction to quaternary deposits. Types and mechanisms of geotechnical disasters relevant to quaternary deposits.
Geo-informatic database	1	Geo-informatic database and its application to modelling soft alluvial soils, liquefaction hazard map, etc.
Evaluation of subsurface structure based on GID	1	Scheme to evaluate subsurface structures using Geo-informatic database including boring logs, geophysical exploration, geological structures. Application to Kyoto basin is given.
Evaluation of liquefaction for near-surface sand depoits	1	Evaluation of liquefaction for near-surface sand deposits using Geo-informatic database is explained. Applications to the 1995 Hyogo-ken Nanbu Earthquake and the 2011 Off the Pacific Coast of Tohoku Earthquake are given, through which open questions are discussed.
Problems of soft clay deposits	1	Deformation characteristics and stability of soft clay deposits and their evaluation methods are explained, e.g., effectiveness and limitation of ground improvement, long term settlement problem, and case histories of large scale reclamation.
Concept of innovative underground structures	1	Citizen-participate-type renovation technique for unpaved roads using sandbags.
Concept of innovative underground structures	1	New construction method of embankments using consecutive precast arch culvert.
Concept of innovative underground structures	2	Technical problems of steel pipe sheet pile. Development of consecutive steel pipe sheet pile and its application.
Outline of earth structures, Unsaturated soil mechanics	2	Roles of earth structures as an infrastructure. Unsaturated soil mechanics.
Damage of earth structures caused by rainfall and earthquake	1	Case examples and their mechanisms of the damages of earth structures caused by rainfall and earthquake.
Methods to evaluate and improve stability of earth structures subjected to rainfall and earthquake	1	Design methods of earth structures and their problems are outlined.
Site visit	1	Visit construction site relevant to the issues of this course.
Evaluation and feedback	1	Evaluation of achievement by assigned reports and its feedback are given.

Textbook Handout will be distributed.
Textbook(supplemental) References are indicated in the handout.
Prerequisite(s) Undergraduate courses in geology, geotechnical engineering, and soil mechanics.
Independent Study Outside of Class
Web Sites
Additional Information

Public Finance

Code 10F203 Course Year Master and Doctor Course Term 1st term Class day & Period Mon 4th

Location C1-173 Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language English

Instructor Kobayashi, Matsushima,

Course Description The concept of public finance will be taught based upon the framework of Macro economics.

Grading Final Exam: 60-70%
Mid-term Exam and Attendance: 30-40%

Course Goals Understand the concept of public finance

Course Topics

Theme	Class number of times	Description
Introduction	1	Explain the outline of this course
GDP and 2. Circular flow model of macro economics	2	Explain about the circular flow model of macro economics and the definition of GDP
Input Output Table and General Equilibrium Model	2	Explain about the input-output table and its role on general equilibrium model
IS-LM Model	2	Explain about IS-LM model to analyze both goods market and money market
International Economics	2	Explain about the international account balance and IS-LM model with trade
AD-AS Model	2	Explain about AD-AS model which analyze the mid term
Economic Growth Model	2	Explain about economic growth model in which long term economic growth is analyzed
Summary	1	Summarize classes and check whether students could achieved its goal.
feedback	1	Accept feedback from students

Textbook

Textbook(supplemental) Dornbusch et al., Macroeconomics 10th edition, Mcgrow-hill, 2008

Prerequisite(s) Basic Microeconomics

Independent Study Outside of Class

Web Sites will be notified in the first class.

Additional Information

Urban Environmental Policy

Code   10F207   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 2nd

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Dai Nakagawa and Ryoji Matsunaka,

Course Description   This lecture aims to learn urban environmental policy and its fundamental theory and methodology to solve social and environmental problems that occur in urban area as well as to understand the structure of these problems.

Grading   evaluation by commitment, tests, reports and examination

Course Goals   to understand the structure of social and environmental problems in urban area and urban environmental policy, its fundamental theory and methodology to solve the problems

Course Topics

Theme	Class number of times	Description
Outline	1	
Structure of urban problems	3	Expansion of urban areas, Increase of Environmental impact, Making compact cities
Basic theory of transportation and environment	2	Downtown activation, Road space re-allocation, Pedestrianisation
Road traffic and Public transportation	2	Characteristics of traffic modes, Light Rail Transit, Bus Rapid Transit, Mobility Management
Fundamental theory for measurements of environmental values	3	Utility, Equivalent Surplus, Compensating Surplus
Methodology to measure environmental values	3	Travel Cost Method, Hedonic Approach, Contingent Valuation Method, Conjoint Analysis
Summary	1	

Textbook   No textbook

Textbook(supplemental)

Prerequisite(s)   basic knowledge of public economics is required

Independent Study Outside of Class

Web Sites

Additional Information

10F215

Intelligent Transportation Systems

Code   10F215   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd   Location   C1-173

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   N. Uno, T. Yamada and T. Nakamura,

Course Description   This class provides you with the outlines of engineering methodology with information and communication technology as its core element for improving the safety, efficiency and reliability of traffic and transportation systems and reducing the environmental burden. Concretely, we discuss the applicability of countermeasures, such as Travel Demand Management, modal-mix in transportation systems, traffic safety improvement schemes for relieving contemporary problems in traffic and transportation systems, in addition to brief introduction of innovative approaches to collect high-quality of real-time traffic data. Moreover, the methodology for policy evaluation and the related basic theory are explained.

Grading   Final report: 50-60%, Mid-term report: 30-40% and Attendance: 10%

Course Goals   Goal of this class is to cultivate basic and critical abilities of students for implementing effective traffic and transportation management using ITS (Intelligent Transportation System).

Course Topics

Theme	Class number of times	Description
Basics for Transportation Network Analysis	1	
Estimation of OD Traffic Volume using Observed Link Traffic Counts	1	
Analytical Approaches Based on Transportation Network Equilibrium	3	
Outlines of ITS	1	
Traffic Management for Enhancing Efficiency	2	
Innovative Approaches for Data Collection Using ICT	1	
Application of ITS for Enhancing Traffic safety	1	
Travel Demand Management and Congestion Charging	2	
Application of Traffic Simulation	2	
Examination	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantitative Methods for Behavioral Analysis

Code   10F219   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 5th

Location   C1-172   Credits 2   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   Satoshi Fujii,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Risk Management Theory

Code   10F223   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 3rd

Location   C1-173   Credits   2   Restriction   Lecture Form(s)   Lecture and exercise   Language   English

Instructor   Muneta Yokomatsu,

Course Description   The aim of the class is to provide the basic knowledge of risk management methods for various types of risks such as natural disaster, environment and natural resources in urban and rural areas. Students will learn the decision making principle under risks in Economics and asset pricing methods in Financial Engineering as well as have exercises of application on public project problems.

Grading   20% of score is valuated on attendance and discussion in classes, and 80% on reports.

Course Goals   It is targeted to understand 1) representative concepts of risk and risk management process, 2) expected utility theory and 3) foundation of Financial Engineering, and examine 4) public project problems by applying the above knowledge.

Course Topics

Theme	Class number of times	Description
Basic framework of risk management	2	1-1 Representative concept of risk
		1-2 Risk management technologies
Decision making theory under risks	3	2-1 The Bayes' theorem
		2-2 The Expected utility theory
Financial engineering	6	3-1 The Capital Asset Pricing Model
		3-2 Option pricing theory
		3-3 The arbitrage theorem
		3-4 The Black-Scholes formula
Decision making methods for projects	3	4-1 The decision tree analysis
		4-2 The real option approach
Comprehension check	1	5 Comprehension check

Textbook

Textbook(supplemental)   1.Ross, S.M.: An Elementary Introduction To Mathematical Finance, Cambridge University Press, 1999

2.Sullivan W.G.: Engineering Economy, Pearson, 2012

Prerequisite(s)   Fundamental understanding of probability

Independent Study Outside of Class

Web Sites

Additional Information

10A805

Remote Sensing and Geographic Information Systems

Code   10A805   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd   Location   C1-117   Credits   2
Restriction   No Restriction   Lecture Form(s)   Lecture & Exercise   Language   Japanese   Instructor   Junichi Susaki

Course Description   Geoinformatics is the science and technologies dealing with spatially distributed data acquired with remote sensing, digital photogrammetry, global positioning system, etc, to address the problems in natural phenomena or human activities. This lecture particularly focuses on satellite remote sensing and explains the theory and the technologies for analyzing environmental changes or disaster effects. A free software "MultiSpec" is used in exercises to learn the basic techniques of image processing.

Grading   Grading is based on the achievements in assignments.

Course Goals   To understand the basic theory and to acquire the basic techniques of satellite remote sensing for observation and analysis of environmental changes and disaster effects.

Course Topics

Theme	Class number of times	Description
Introduction	0.5	Introduction to remote sensing and GIS is given, and the software supposed to use is introduced.
Coordinate system and map projection	0.5	Principal coordinate systems and map projection methods used for satellite image and GIS data are explained.
Analysis of DEM	1	Analysis of digital elevaltion model (DEM) is explained.
(Analysis 1) Landslid hazard mapping using DEM	1	Thematic maps produced from DEM are presented, and the reliability and applicability are discussed.
Radiation and reflection of electromagnetic waves, and optical sensor	1	Basic terms on electromagnetic radiation including radiation and reflection are introduced, and calculation of suface reflectance and temperature is explained. In addition, principles and applications of visible and infrared sensors are introduced.
Land cover classification	1	Theory and procedure of land use/cover classification using satellite images are explained.
(Analysis 2) Land cover classification using reflectance, temperature and elevation data	1	Concept of synthetic aperture radar (SAR) is first introduced, and the image processing, statistical property, speckle filtering and polarimetric SAR are explained.
Property of SAR	1	Theory of Interferometric SAR (InSAR) and differential InSAR (DInSAR) is introduced. Then, long-term monitoring of land deformation by using multi-temporal SAR imagges is explained.
Measurement of topography using SAR data	1	Land cover maps produced from optical satellite images and elevation data are presented, and the classifiers and data used are discussed.
Least square method	1	Least square method (LSM) for generating estimates from observations is explained.
Spatial statistics	1	Spatial auto-correlation observed among spatial data and removal of the effect are explained.
Generation of DEM from airborne LiDAR data and application to landscape analysis	1	Generation of digital surface model (DSM) from airborne light detection and ranging (LiDAR) data is explained. As an application, landscape assessment using airborne LiDAR data is introduced.
Generation of DEM using photogrammetry	1	Generation of DSM by using photogrammetry, and the difference of DSMs between photogrammetry, SAR and airborne LiDAR is explained.
Image correction	1	Geometric and atmospheric corrections necessary for satellite image processing are explained.
(Analysis 3) Assessment of residential environment considering landscape and hazard risk	1	Analysis of areas providing comfortable residential environment, such as vegetation, accessibility to the transport network and disaster risk, is presented, and the validity and applicability to other areas are discussed.
Assessment of understanding	1	Assess students' understanding levels

Textbook

Textbook(supplemental)   • Junichi Susaki and Michinori Hatayama, Geoinformatics, Corona Publisher, 2013

• W. G. Rees   Physical Principles of Remote Sensing 3rd ed., Cambridge University Press, 2013.

• J. A. Richards and X. Jia   Remote Sensing Digital Image Analysis: An Introduction, 5th ed., Springer-Verlag, 2013.

M. Netler and H. Mitasova, Open Source GIS: A GRASS GIS Approach 3rd ed., The International Series in Engineering and Computer Science, 2008.

Prerequisite(s)   Basic knowledge in computer information processing

Independent Study Outside of Class

Web Sites   http://www.envinfo.uee.kyoto-u.ac.jp/user/susaki/rsgis.html

Additional Information

10A808

Civic and Landscape Design

Code   10A808   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 3rd

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture and practice

Language   Japanese   Instructor   Masashi Kawasaki,Yoshiaki Kubota,Keita Yamaguchi,Keiichiro Okabe,

Course Description

Grading   Reports (Kawasaki: 50%) and design practice (Okabe: 50%)

Course Goals

Course Topics

Theme	Class number of times	Description
Guidance. Landscape and image	1	
Architectural Design of city and urban facilities	2	
Atmosphere and color of Japan	1	
Design of waterfronts	1	
Design of bridges	1	
Design of Urban landscape	2	
Landscape policy and design management	1	
Design practice	5	
Feedback	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Computational Mechanics and Simulation

Code   10K008   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture and Exercises   Language   English

Instructor   Ishida, Lin, Furukawa, Flores,

Course Description   The process to obtain numerical solutions for various problems in computational mechanics. Discretization and some solving technique for initial/boundary value problems is to be introduced by the FEM. Fundamental concept of boundary element method (BEM) and its applications in the engineering field will be introduced. Statistical mechanics, molecular dynamics, Monte Carlo method and Multiple scale model will be shortly introduced in order to understand the basic theory of molecular dynamics simulation. Their applications to engineering problems are to be also given by showing some up-to-date examples. Theory of the distinct element method (DEM) will be lectured, and its application in the engineering field will also be explained. Study of contaminant migration in subsurface via groundwater flow modelling coupled with advective-dispersive solute transport. The general groundwater flow and chemical transport in porous media are introduced, then the governing equations for advective-dispersive chemical transport, and the analytical solution of the governing equations are explained. This course will be given in English.

Grading   Achievement is evaluated by submitted reports to each topic.

Course Goals

Course Topics

Theme	Class number of times	Description
Finite difference method	3	Explicit-FDM is explained using an example of unsteady motion of a mass point based on Voigt model. In addition, the numerical simulation results are compared to their theoretical solutions and discussed.
Boundary element method and Molecular dynamics simulation	4	Fundamental concept of boundary element method (BEM) and its applications in the engineering field will be introduced. Monte Carlo method and Multiple scale model will be shortly introduced in order to understand the basic theory of molecular dynamics simulation. Their application to engineering problems are to be also given by showing some up-to-date examples.
Distinct element method and its application	4	Theory of the distinct element method (DEM) will be lectured in this item. The DEM is the numerical analysis method for discontinuum. The application of the DEM in the engineering field will also be explained.
Migration of Contaminants in Subsurface	3	Study of contaminant migration in subsurface via groundwater flow modelling coupled with advective-dispersive solute transport. In this section, we will first introduce the general groundwater flow and chemical transport in porous media, then we will learn about the governing equations for advective-dispersive chemical transport, and finally we will define the parameters and find the analytical solution of the governing equations. Some numerical results will be used as examples to understand the process.
Confirmation of the learning achievement degree	1	Confirmation of the learning achievement degree

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Applied Elasticity for Rock Mechanics

Code   10F071   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 3rd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   S. Murata

Course Description   Theory of elasticity relating to the deformation and failure of rock and rock mass   and design of rock structures is explained. Specifically, two-dimensional and three-dimensional analysis of elasticity using the basic equations, constitutive equations, and the complex stress function are explained. Several applications of this analysis to rock mechanics, rock engineering, and fracture mechanics are also explained.

Grading   Evaluation is made by the score of two report problems or homework and semester final exam.

Course Goals   The goal of this class is to master the theory of elasticity so as to solve the elastic problem in rock mechanics, rock engineering, and fracture mechanics.

Course Topics

Theme	Class number of times	Description
Airy's stress function and complex stress function	2	Airy's stress function used to solve a two-dimensional elastic problem is first explained, and then the complex stress functions that are the representation of Airy's stress function by the complex variables are explained.
Two-dimensional elastic analysis using the complex stress function	8	Analytical solutions of two-dimensional elastic problems in fracture mechanics and rock engineering are derived by using the complex stress functions. The mechanical behavior of rock material is also explained based on the derived solutions.
Application of two-dimensional elastic analysis	2	The theory of rock support, ground characteristic curve, theoretical equations used for the evaluation of rock stress, which are derived from the solution of two-dimensional elastic problem, are explained.
Three-dimensional theory of elasticity	2	Stress functions to solve the three-dimensional elastic problem are explained, and some examples of the three-dimensional elasticity solution are explained.
Summary and Achievement check	1	The contnts of this class are summarized. In addition, the achievement of course goals is checked.

Textbook   Handouts are delivered.

Textbook(supplemental)   J.C. Jaeger, N.G.W. Cook, and R.W. Zimmerman: Fundamentals of Rock Mechanics -4th ed., Blackwell Publishing, 2007, ISBN-13: 978-0-632-05759-7

Prerequisite(s)   The knowledge and calculation skill of calculus, vector analysis and complex analysis are required.

Independent Study Outside of Class

Web Sites   Web page of this lecture is not specifically provided. When preparing it by need, the information is shown in the class.

Additional Information   Not specified

Fundamental Theories in Geophysical Exploration

Code   10F073   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 5th

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hitosih Mikada, Tada-nori Goto,

Course Description   We are outlining various basic mathematical principles used for the analysis of the dynamic and kinematic earth-scientific problems in conjunction with wave propagation, mass transfer, etc. in the crust, and presenting examples of such analysis techniques in the area of earth sciences and earth resources engineering.

Grading   Rating is performed by the combination of exams (40%) and the attendance to the class (60%).

Course Goals   The aims of the class is to understand various signal-processing theories, the applied seismology, and the applied geo-electromagnetics with respect to exploration geophysics as application tools in seismology and in geo-electromagnetics.

Course Topics

Theme	Class number of times	Description
Introduction to exploration geophysics	1	General introduction to the lecture.
Seismic wave propagation and signal processing	8	Acquire knowledge on the propagation phenomena of elastic waves to learn the equivalency of 1D propagation with the theory of system function. The topics included would be, z-transform, Levinson recursion, Hilbert transform, etc.
Fundamentals of geo-electromagnetics and their application to exploration geophysics	5	Learn fundamental theories of magnetotellurics, instantaneous potential, spontaneous potential, and apparent resistivity methods, etc. that deal with geo-electromagnetic phenomena. Case studies are introduced to understand the advantages of geo-electromagnetic exploration schemes.
Wave propagation problem in seismic exploration	1	Discussing fundamental theories of elastic wave propagation, used in subsurface structural surveys, in terms of the actual utilization and the theories of wave phenomena.

Textbook

Textbook(supplemental)   Claerbout, J.F. (1976): Fundamentals of Geophysical Data Processing (Available online URL: http://sep.stanford.edu/oldreports/fgdp2/)

Prerequisite(s)   Students should understand exploration geophysics of undergraduate level.

Independent Study Outside of Class

Web Sites   Could be specified by the lecturers if any.

Additional Information

10A405

Environmental Geosphere Engineering

Code   10A405   Course Year   Master Course   Term   1st term   Class day & Period   Wed 2nd   Location   C1-171

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   Katsuaki KOIKE,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction of structure and content of this course	1.5	
Physics of Earth system	2.5	
Chemistry of Earth system	2.5	
Fundamentals of Geoinformatics (1): Spatical modeling techniques	2	
Fundamentals of Geoinformatics (2): Scaling of geological structure	1	
Fundamentals of Geoinformatics (3): Remote sensing	3	
Fundamentals of Geoinformatics (4): Earth survey and geochemical exploration	1	
Geosphere environments (1): Weathering process and geohazards	1	
Geosphere environments (2): CCS and HLW	1	
Mineral and energy resources	1.5	

Textbook   Handouts will be distributed at each class.

Textbook(supplemental)   References will be introduced in the handouts.

Prerequisite(s)   Fundamental knowledges on geology, physics, and chemistry are required.

Independent Study Outside of Class

Web Sites

Additional Information

Earth Resources Engineering

Code 10F088   Course Year Master and Doctor Course   Term 2nd term   Class day & Period Wed 2nd

Location C1-171   Credits 2   Restriction No Restriction   Lecture Form(s) Lecture   Language English

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	2	
	1.5	
	1.5	
	1	
	1	
	1	
	1	
	2	
	1	
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10F234

Water Sanitary Engineering

Code   10F234   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   C1-192   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English/Japanese   Instructor   Sadahiko Itoh, Shinya Echigo, Yasuhiro Asada

Course Description   The ultimate goal of this course is to understand "Sanitary Engineering" quantitatively. Students will learn methods to quantify chemical and microbial risk in drinking water and realize concept and methods of risk management and control.

Grading   Evaluated by assignments.

Course Goals   To quantify chemical and microbial risk in drinking water and to realize methodologies of risk management and control.

Course Topics

Theme	Class number of times	Description
Environmental risk and quantification	1	Introduction and goal of the class. Concept of "Sanitation". Environmental risk and quantification. Safety of drinking water and acceptable risk level.
Risk assessment and control of hazardous chemicals	3	Risk assessment of hazardous chemicals. Drinking water quality standards. Derivation of drinking water quality standards. The benchmark dose method.
Quantitative microbial risk assessment and management	5	Coexistence and competition between human and microbes. Quantitative microbial risk assessment (QMRA). Comparison of the risk assessment and management methods between chemicals and microbes. Disability adjusted life years (DALYs).
Perspectives of water treatment technology	5	Development of advanced water treatment processes. Water supply technology and its prospects. Water reuse and health risk. Access to safe drinking water in developing countries and global burden of disease.
Feedback and summary	1	Feedback of assignments and summary.

Textbook   Class handouts

Textbook(supplemental)   Itoh, S., Echigo, S.: Disinfection By-products in Water, GIHOUDOU SHUPPAN Co., Ltd., 2008 (in Japanese).

Prerequisite(s)   General understanding of water quality and water treatment process

Independent Study Outside of Class

Web Sites   Data for assignments will be at http://www.urban.env.kyoto-u.ac.jp

Additional Information

Ecomaterial and Environment-friendly Structures

Code   10F415   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 1st

Location   C1-117   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hirotaka KAWANO,Atsushi HATTORI,Toshiyuki ISHIKAWA,

Course Description   Lecture on outline of impact of construntion materials to environment and influence on materials and structures from environment. Discuss how to use materials sustainably. Keywords are concrete, steel, composite materials, CO2, durability, recycle and reuse, life-cycle assessment.

Grading   Attendance(%), Report(%),Presentation(%)

Course Goals   To understand the limit of resources and effect of material use to environment. and to understand the basic theory to make environmental-friendly infrastructures from the view point of materials use.

Course Topics

Theme	Class number of times	Description
Guidance	1	Object of the Course, Grading and Goals
product of materials and impact to environment	1	Product of cement, steel, concrete CO2 product and its influence
recycle and reuse of materials	3	Recycle and reuse of steel, metals, concrete, asphalt, plastics Technology development of construction materials
deterioration of concrete structures	1	Mechanism of deterioration of concrete structures: carbonation, salt attack, alkali-aggregate reaction Maintenance and retrofit methods
deterioration of steel structures	1	Mechanism of deterioration of steel structures: corrosion, fatigue Maintenance and retrofit methods
deterioration of composite structures	1	Mechanism of deterioration of composite structures: Maintenance and retrofit methods
life-cycle assessment of structures	1	Life-cycle assessment of structures considering initial cost as well as maintenance cost
topics and discussion	2	Recent topics on construction materials and discussion
presentation by students and discussion / feedback	4	Presentation by students on the individual topics Discussion on the topics. "Feedback" at the last class

Textbook   No set text

Textbook(supplemental)   Instructed in class

Prerequisite(s)   Basic knowledge of construction materials, concrete engineering

Independent Study Outside of Class   Check the handouts. Additional studies will also be instructed.

Web Sites

Additional Information   Questions and discusions are welcome

10F454

Systems Approach on Sound Material Cycles Society

Code 10F454 Course Year Master and Doctor Course Term 1st term Class day & Period Mon 3rd Location C1-192

Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese/English

Instructor Shinichi Sakai, Yasuhiro Hirai,

Course Description It has become a major political/ social issue to establish a Sound Material-Cycle Society in order to save the earth resources and energy and to preserve environmental conservation. This course mainly covers the following topics: 1) History, current status, and future prospect of waste issues and establishment of a sound material-cycles society. 2) Basic concepts and current conditions/ challenges of the following items: The Basic Law for Establishing the Material Cycles Society and the Basic Plan for accomplishing it; Containers and Packaging Recycling Law; Home Appliance Recycling Law; End-of-Life Vehicle Recycling Law and others. 3) Basic concept and application of material flow analysis and life cycle assessment; these tools are important to grasp the whole flow of each recycling, resource use, product consumption, recycle and disposal of waste electrical and electronic equipment, for which it is required to take Clean Cycle & Control concepts in relation to chemical substances. Along with above topics, source origin, behavior, and decomposition of persistent organic pollutants, which should be inevitably linked to the realization of a Sound Material-Cycle Society, will also be discussed in the class.

Grading Evaluation will be done based on the test scores and learning attitude in class.

Course Goals The goal of this class is to help students understand the systems and technologies for establishing a Sound Material Cycles Society; students learn how to think about material flow analysis and life cycle assessment in order to develop deep understanding of the whole system of material flow (i.e., resource use, product consumption, cycles and disposal of waste).

Course Topics

Theme	Class number of times	Description
The Basic Law for Establishing the Material Cycles Society and the Basic Plan for Material Cycles	1	Lean the frame work and three indices of this basic plan in detail, and examine recent globally developed " 3R Initiative" activities and status of material cycles in Asian countries.
Development of Each Recycling System	3	Learn the following items separately designated as effective measures under The Basic Law for Establishing the Material Cycles Society: 1) Containers and packaging 2) Home Appliance 3) End-of-Life Vehicle 4) Construction Material 5) Food Material
Each Recycling System and Clean, Cycles & Control Concepts	3	Examine application of the following strategic concepts for waste electrical and electronic equipment, end-of-life vehicles, and battery waste. 1) Clean: Avoid the use of hazardous waste and chemical substances. 2) Cycle: Apply cycle concept when use effects are expected but no alternatives are available.
Basic concept and application of material flow and life cycle analyses	5	Lean about basic concept of Material Flow Analysis (MFA) and Life Cycle Assessment (LCA). Examine food waste recycling using these analyses as a case study.
Environmental Transport Model and Behavior of Persistent Organic Pollutants (POPs)	2	Learn basic concept and application of the model. Examine case studies of global mobility of POPs and behavior of PCB on regional and global scales.
Confirmation of Attainment	1	Confirm students' levels of understanding on the course topics, and make sure of the points of MFA, LCA, and systems and techniques for establishing a sound material-cycle society.

Textbook Not specified. Materials and references will be distributed when needed.

Textbook(supplemental) Introduced in class when necessary.

Prerequisite(s) Solid Waste Management

Independent Study Outside of Class

Web Sites

Additional Information

Geohydro Environment Engineering. Adv.

Code   10A622   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 1st

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Atmospheric and Global Environmental Engineering, Adv.

Code   10F446   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese/English

Instructor   Gakuji KURATA,

Course Description   The contents of the lecture are as follows. (1) History of Global Warming problem, Radiative forcing, Green house gas emission, Carbon cycle, Mechanism of Climate Change, Mitigation measures, Social and Natural impact of Climate change (2) Mechanism of formation of Photochemical oxidant and Acid rain, Global scale transportation of atmospheric pollutants, Deposition and its impact of air pollutants, control measure of air pollution. Also, students make presentation and discussion on the related papers.

Grading   Points are allocated for the quiz at every lectures, the presentation and discussion, report.

Course Goals

Course Topics

Theme	Class number of times	Description
Guidance, IPCC, Observation of a climate change	1	(Kurata)
Radiative forcing	1	(Kurata)
Greenhouse gas	1	(Kurata)
Carbon cycle and response of climate	1	(Kurata)
Impact of Climate Change	1	(Kurata)
Energy system and mitigation of climate change	1	(Kurata)
Cross-border transportation and the international measure against air pollution	1	(Kurata)
Urban Air pollution	1	(Kurata)
Acid Deposition and its impact	1	(Kurata)
Simulation of advection and diffusion	1	(Kurata)
Simulation of Atmospheric Chemistry	1	(Kurata)
Indoor air pollution and health impact	1	(Kurata)
Practice	2	(Kurata)
Achievement test	1	

Textbook   Handout

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Environmental Health

Code   10A626   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 3rd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Seminar   Language   Japanese

Instructor   Hirohisa Takano,Kayo Ueda,

Course Description   Environmental factors and genetic factors are responsible for our health and diseases. This seminar has the lecture on the relationships between environmental factors and our health. Also, Students make presentation and discussion on the previous and recent environmental problems, with special emphasis on their relation with health concerns.

Grading   Points are allocated for the activities on the presentation and discussion.

Course Goals   Students learn about the fundamentals of environmental health and make use of the knowledge for the development of related areas.

Course Topics

Theme	Class number of times	Description
Environment and health	1	Lecture on the relationships between environmental factors and our health
Seminar on the previous and recent environmental problems	14	Presentation and discussion on the previous and recent environmental problems, with special emphasis on their relation with health concerns

Textbook   on demand

Textbook(supplemental)   on demand

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10A632

Urban Metabolism Engineering

Code   10A632   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 3rd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English / Japanese   Instructor   Masaki Takaoka, Gakuji Kurata, Kazuyuki Oshita,

Course Description   Much energy and resources are consumed to maintain various activities in urban city. As the result, various environmental loads such as exhaust gas, wastewater and waste generate and should be reduced to levels natural environment can accept .To establish sustainable urban metabolism, concept, elements, control, optimization and management of urban metabolism are explained.

Grading   Small tests and reports are evaluated.

Course Goals   To understand technological measures by learning about current trend and issue of urban metabolism and related engineering principles.

Course Topics

Theme	Class number of times	Description
Introduction	1	Concept of urban metabolism and its system are explained
Elements of urban metabolic system	8	Planning and selection of urban metabolic system, Transportation & collection, Engineering principles on Recycling, Thermal recovery, Engineering principles on flue gas treatment and Landfill management are explained.
Control, optimization and management of urban metabolic system and environmental equipment	3	Fundamentals of control theory, optimization, system identification and simulation of urban metabolic system and environmental equipment
Design of sewage treatment system in urban area	2	Properties and chemical compositions of sewage and sludge. Introduction and developing trend of sewage treatment system. Elemental and heat balance analysis of sedimentation, aeration tank, anaerobic fermentation and incineration.
Feedback and summary	1	Feedback of small tests and summary

Textbook   Recent paper and/or books will be used.

Textbook(supplemental)

Prerequisite(s)   Environmental plant engineering

Independent Study Outside of Class

Web Sites

Additional Information

Environmental Microbiology, Adv.

Code   10A643   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 1st

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hiroshi TSUNO, Hiroaki TANAKA, Fumitake NISHIMURA, Naoyuki YAMASHITA,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10F456

New Environmental Engineering I, Advanced

I

Code   10F456   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 5th

Location   Reserch Bldg.No.5-Lecture Room(2nd floor)/C1-171   Credits   2   Restriction   No Restriction

Lecture Form(s)   Relay Lecture   Language   English   Instructor   Y. Shimizu (Prof), H. Tanaka (Prof), and S. Fujii (Prof),

Course Description   This course provides various kinds of engineering issues related to the water environment in English, which cover fundamental knowledge, the latest technologies and regional application examples. These lectures, English presentations by students, and discussions enhance English capability and internationality of students.

The course is conducted in simultaneous distance-learning from Kyoto University, or from remote lecture stations in University of Malaya, and Tsinghua University of China. For the distance-learning, a hybrid system is used, which consists of prerecorded lecture VIDEO, VCS (Video conference system) and SS (slide sharing system).

Grading   Evaluated by class attendance, Q&A and presentation.

Course Goals   Each student is requested to give a short presentation in English in the end of the course. The students will understand the present circumstance of environments in the world, and the students may improve their English skill and international senses through these lectures, presentations, and discussions.

Course Topics

Theme	Class number of times	Description
Wastewater Treatment in Japan	1.4	Guidance & Self Introduction of Students & Lecturer on " Wastewater Treatment Plants Case Study in Japan (Fujii)
Ecological Sanitation	1.4	From Ecotoilets to Ecotowns Shimizu)
Wastewater Treatment in China and Nutrient Removal	1.4	Wastewater Treatment Plant: Case Study in China, Biological Nutrient Removal (BNR) (Prof. Wen, Tsinghua University)
Wastewater Reuse	1.3	Wastewater Reuse & Disinfection (Tanaka)
Wastewater Treatment in Malaysia	1.4	History of Water Pollution in Malaysia (Prof. Ghufran, University of Malaya) Case studies of wastewater treatment plants design & operation (Prof. Nuruol, University of Malaya)
Anaerobic Treatment	1.3	Anaerobic Biological Treatment Technologies (Prof. Shaliza, University of Malaya)
Membrane Technology	1.3	Treatment Technologies (Practical & Advanced Technology I): Membrane Technology (MT) (Prof. Huang, Tsinghua University)
Advanced Oxidation Processes	1.3	Advanced Oxidation Processes (Prof. Zhang, Tsinghua University)
Student Presentation	1.4	Student Presentations /Discussions I (all)
Student Presentation	1.4	Student Presentations /Discussions II (all)
Student Presentation	1.4	Student Presentations /Discussions III (all)

Textbook   Class handouts

Textbook(supplemental)   Introduced in the classes

Prerequisite(s)   General understanding of water environmental issues

Independent Study Outside of Class   The students should study the PPT file used in the lectures. Students also need to enough literature review and related prior to their presentation.

Web Sites

Additional Information   PowerPoint slides are main teaching materials in the lectures, and their hard copies are distributed to the students. In addition, a list of technical terms and difficult English words is given to the students with their explanation and Japanese translation.

New Environmental Engineering II, Advanced

II

Code 10F458 Course Year Master and Doctor Course Term 2nd term Class day & Period Mon 5th

Location Reserch Bldg.No.5-Lecture Room(2nd floor)/C1-171 Credits 2 Restriction No Restriction Lecture Form(s) Lecture

Language English Instructor Prof. Shimidzu, Prof. Takaoka, Associate Prof. Kurata, Prof. Fujii,

Course Description This course provides various kinds of engineering issues related to atmospheric environment and solid wastes management in English, which cover fundamental knowledge, the latest technologies and regional application examples. These lectures, English presentations by students, and discussions enhance English capability and internationality of students. The course is conducted in simultaneous distance-learning from Kyoto University, or from remote lecture stations in University of Malaya, and Tsinghua University. For the distance-learning, a hybrid system is used, which consists of prerecorded lecture VIDEO, VCS (Video conference system) and SS (slide sharing system). The students are requested to give a short presentation in English in the end of the lecture course. This course may improve students' English skill and international senses through these lectures, presentations, and discussions.

Grading Evaluate by class attendance, Q&A and presentation.

Course Goals

Course Topics

Theme	Class number of times	Description
Global warming and Low carbon society	1.4	Global warming and Low carbon society
Atmospheric diffusion and modeling	1.4	Atmospheric diffusion and modeling (Prof. S Wang, Tsinghua University)
Air Pollution, Its Historical Perspective from Asian Countries (I),China	1.4	Air Pollution, Its Historical Perspective from Asian Countries (I),China (Prof. Hao, Tsinghua University)
Air Pollution, Its Historical Perspective from Asian Countries (II), Malaysia	1.4	Air Pollution, Its Historical Perspective from Asian Countries (II), Malaysia (Prof. Nik, University of Malaya)
Air Pollution, Its Historical Perspective from Asian Countries (III), Japan	1.4	Air Pollution, Its Historical Perspective from Asian Countries (III), Japan (Kurata)
Student Presentations /Discussions I	1.4	Student Presentations /Discussions I (all)
Introduction to Municipal Solid Waste (MSW) Management in Malaysia	1.4	Introduction to Municipal Solid Waste (MSW) Management in Malaysia (Prof. Agamuthu, University of Malaya)
Solid Waste Management, Case Study in China	1.4	Solid Waste Management, Case Study in China (Prof. Wang, Tsinghua University)
Solid Waste Management, Case Study in Japan	1.4	Solid Waste Management, Case Study in Japan (Takaoka
Solid Waste Management, Case Study in Malaysia	1.4	Solid Waste Management, Case Study in Malaysia (Prof. Agamuthu, University of Malaya)
Student Presentations /Discussions II	1	Student Presentations /Discussions II (all)

Textbook Class handouts

Textbook(supplemental) Introduce in the lecture classes

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information Either of this course or " New Environmental Engineering I, advanced" can be dealt as " Asian Environmental Enigneering" . PowerPoint slides are main teaching materials in the lectures, and their hard copies are distributed to the students. In addition, a list of technical terms and difficult English words is given to the students with their explanation and Japanese translation.

10F461

Nuclear Environmental Engineering, Adv.

Code 10F461   Course Year Master and Doctor Course   Term 1st term   Class day & Period Thu 2nd   Location C1-192   Credits 2
Restriction No Restriction   Lecture Form(s) Relay Lecture   Language Japanese   Instructor Yoko Fujikawa,Satoshi Fukutani, Maiko Ikegami
Course Description   Various wastes are generated from the use of nuclear energy, one of the key technologies to overcome the global warming, and the associated industrial activity. This course is inended to understand the type and origin of radioactive wastes, as well as the management, treatment, and final disposal of these wastes, from the viewpoint of environmental engineering.
Grading   Attendance to the lecture plus report
Course Goals   By providing the students with the knowledge on various radioactive wastes generated by the use on neclear energy as well as the radiological risk of such wastes, the course will enable the students to consider the future of nuclear industries based on their own judgement.
Course Topics

Theme	Class number of times	Description
Course Introduction	1	Course Introduction
Nuclear disaster action program	1	uclear disaster action program
Nuclear reactors	1	Nuclear reactors
Treatment of liquid radioactive waste	1	Treatment of liquid radioactive waste
Treatment of gaseous and solid radioactive waste	1	Treatment of gaseous and solid radioactive waste
Legislation of radioactive wastes	1	Legislation of radioactive wastes
Decomissining and clearance	1	ecomissining and clearance
Radiological risk	1	The risk of radiation exposure, history of radiation dose limit set by international organizations, and dose limit under different situations are discussed
Fukushima Daiichi Nuclear Power Plant (F1) accident and nuclear disaster prevention	1	Discuss the relation between the events in F1 and the radiation dose in the environment as well as pollution of environment. The evacuation activity conducted in Fukushima and the related lessons are summarized.
Problems of designated waste	1	In the aftermath of the F1 accident, municipal solid waste contaminated with radioactive cesium has been produced in 12 Prefectures, some of these wastes were classified as designated wastes (DSW). The concept of DSW is compared with that of conventional radioactive wastes.
Geological disposal of high level radioactive wastes (HLW) and the safety assessment	1	Inventory, the method of disposal (critical path and nuclides), philosophy of radiological protection, etc. are discussed.
Behavior of radionuclides in the environment and mathematical modeling of nuclide migration	1	Behavior of radionuclides in the geosphere has governing effect on the safety of geological disposal of HLW. The behavior based on the chemical characteristics of each nuclides and mathematical modeling of their behavior are discussed.
Behavior and qualitative/ quantitative analysis of radionuclides in the environment	1	Behavior and qualitative/ quantitative analysis of radioactive Cs, Co, Sr, I, Se, U, Pu and Ra in the environment, and events of radioactive pollution of the environment in the past, are introduced.
The risk of radiation and the society	1	After the F1 accident, the risk of radiation has drawn intense attention from citizens. The risk communication methodology to facilitate the understanding of radiation is discussed.
Discussion with /between students	1	Discussion on issues such as lifestyle in the contaminated environment (under existing exposure situation), whether residents should return to the contaminated areas, and how to deal with siting problems of final disposal of HLW, etc..

Textbook   Related papers etc. will be distributed in each lecture.
Textbook(supplemental)   Related literature will be notified in each lecture.
Prerequisite(s)   Basic knowledge on health physics, chemistry and earth science.
Independent Study Outside of Class   NOt specified.
Web Sites   None
Additional Information   None

Environmental-friendly Technology for Sound Material Cycle

Code   10H424   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 3rd

Location   C1-192   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,,,,,,

Course Description   Global warming, ecosystem crisis, and depletion of natural resources are of great concern today. To solve these problems, we have to build the sustainable society where low carbon dioxide emission, low environmental burdens, and the reduction of wastes by recycling are realized. It is possible to utilize municipal wastes, wastewaters, and unused biomass as resources instead of the natural resources used at present. Recycling-oriented technologies that enable sustainable utilization of those wastes and the concept to develop those technologies are introduced.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	5	
	3	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10F468

Environmental Organic Micropollutants Analysis Lab.

Code   10F468   Course Year   Master and Doctor Course   Term   Intensive course (27-29th Sep.)

Class day & Period   9:00 am- 6:00 pm

Location   Seminer Room, Research Center for Environmental Quality Management   Credits   2

Restriction   around 10 students   Lecture Form(s)   Intensive Lecture   Language   Japanese

Instructor   Shimizu, Yoshihisa,Matsuda, Tomonari,

Course Description   There is increasing concern about proper risk evaluation and management of hazardous chemicals such as dioxins and endocrine disruptors. To manage this problem, it is necessary to understand analytical methods and toxicity of those hazardous chemicals. In this class, lectures and experiments will be carried out about chromatography, bioassays and mass spectrometry.

Grading   It is required to attend all 3 days for lectures and experiments. Attendance and reports are considered for grading.

Course Goals   Understand about principle and practical techniques of chromatography. Understand about principle of several bioassays.

Course Topics

Theme	Class number of times	Description
HPLC -How to separate it-	3	Learn about principle and practice of HPLC separation. How do you choose columns, solvents and detectors? How to improve peak separation?
Fractionation and Purification by using HPLC	3	Learn about practical techniques of fractionation and purification using HPLC.
LC/MS/MS	5	Learn about principle and practice of LC/MS/MS analysis. Understand about 3 different scan modes, full scan, daughter scan and MRM. How to make an analytical method in a refined way for substances of your interest.
Bioassays	4	Lecture about several bioassays which are used for evaluation of environmental toxicity, and discuss about how to identify toxic compounds in environment by using HPLC in combination with bioassays.

Textbook   Handouts are distributed.

Textbook(supplemental)   Daniel C. Harris: "Quantitative Chemical Analysis" ISBN-13: 978-1-4292-3989-9

Prerequisite(s)

Independent Study Outside of Class   We hope active participation of students. It is welcome that patticipants additionally try to analyze the sample their own interest.

Web Sites

Additional Information   This intensive course is useful especially for students who usually use or intend to use HPLC and LC/MS/MS for their research.

Advanced Enivronmental Engineering Lab.

Code　10F470　　Course Year　Master and Doctor Course　　Term　2nd term

Class day & Period　Monday 3,4　　　Location　C1-173　　Credits　2　　Restriction　less than 10 students

Lecture Form(s)　Seminar and Exercise　　Language　English / Japanese

Instructor　Sadahiko Itoh,MInoru Yoneda,Masaki Takaoka,Shinya Echigo,Gakuji Kurata,Makoto Yasojima,

Course Description　Analytical methods to characterize environmental samples are learnt through practical training including site visit to other research institute or analytical company. Also, integration of environmental information using GIS is also mastered.

Grading　Attendance at the class　(50%) and report subjects(50%) are evaluated.

Course Goals　To promote your own research by learning each research method with wide vision

Course Topics

Theme	Class number of times	Description
Guidance and Safety Education		The content of subject and safety education for the following experiment are explained.
Quantitative analysis of elements		The principle of multielement analysis is explained and practical training of ICP-AES or ICP-MS machine is conducted.
Qualitative analysis of elements	2	The principle of X-ray based methods is explained and practical training of one or two X-ray based machine is conducted.
Qualitative analysis of organic compounds and bioassey	5	Qualitative analysis of organic compounds such as mass spectrometry, NMR, ESR and IR and bioassey are explained and practical training of GC-MS etc. is conducted.
GIS		The way to use GIS is learnt.
Site visit		Site visit to research institute or analytical company

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminer on Practical Issues in Urban and Environmental Enginering

Code   10F472   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Fri 4th

Location   C1-192   Credits   2   Restriction   No Restriction   Lecture Form(s)   Seminar   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Transport Phenomena

Code 10G039 Course Year Master and Doctor Course Term 2nd term Class day & Period Fri 3rd

Location C3-Lecture Room 2 Credits 2 Restriction Lecture Form(s) Lecture Language Japanese

Instructor Nakabe, Kazuyoshi,Tatsumi, Kazuya,

Course Description The important learning objective of this class is to understand the fundamental mechanisms of momentum, heat, and mass transfer phenomena, the knowledge of which will be markedly required for the thermal energy control technologies to further practice conservations of natural resources and energies for sustainable development. Heat and mass transfer processes consisting of conduction and forced/natural convection will be highlighted in detail, referring to the similarity characteristics of flow velocity, fluid temperature, and species concentration. Some topics on Reynolds stress, turbulent heat flux, and phase change will be introduced, expanding to their numerical models, together with some recent trends of high-tech heat and energy devices.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Surrounding Examples of Transport Phenomena	1	
Governing Equations and Non-Dimensional Parameters	3 4	
Boundary Layer Flows	2 3	
External and Internal Flows	1 2	
Turbulent Phenomena	2 3	
Topics of Flow and Heat Transfer Mechanism	2 3	
Estimation on Study Achievement	1	

Textbook

Textbook(supplemental) Example: Transport Phenomena (Bird, R.B. et al.)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10G009

Quantum Condensed Matter Physics

Code   10G009   Course Year   Master Course   Term   1st term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Global Survivability Studies

Code 10F113   Course Year Master and Doctor Course   Term 1st term   Class day & Period Thu 5th

Location Yoshida, Higashi Ichijokan, Shishukan Hall   Credits 2   Restriction No Restriction   Lecture Form(s) Lecture

Language English   Instructor Kaoru Takara, Junji Kiyono, Satoshi Fujii, Takahiro Sayama, Mika Shimizu

Course Description   Modern global society is facing risks or social unrests that are caused by huge natural hazards and disasters, man-made disasters and accidents, regional environmental change/degradation including infectious diseases, and food security. Introducing such examples at global and regional scales, this subject lectures how to cope with them at national, local and community levels for making the society sustainable/survivable. Future countermeasures are also discussed under the uncertain circumstances such as climate change, population growth, energy and socio-economic issues.

Grading   Attendance to lectures (40%) and Presentation and discussion (60 %).

Course Goals   The objectives of this class are to have basic knowledge about global issues threatening safety and security of the earth society such as catastrophic natural disasters, man-made disasters and accidents, regional environmental change (including infectious diseases) and food security, and to enhance student's ability to express his/her own ideas and discuss with professors and students from other study areas.

Course Topics

Theme	Class number of times	Description
Introduction of Global Survivability Studies	1	Introduction of Global Survivability Studies.
Earthquake disaster mitigation	1	Discuss on earthquake disaster mitigation focusing on lessons learnt from Tohoku EQ.
Mitigation of earthquake damage to historic structures	1	Discuss on the mitigation of earthquake damage to historic structures.
Why we need GSS?	1	Discuss on why we need Global Survivability Studies (GSS).
Global agendas for sustainable development and resilient societies	1	Discuss on global agendas for sustainable development and resilient societies.
Building national resilience in Japan	1	Discuss on building national resilience based on Japanese experiences.
Globalism as totalitarianism	1	Discuss on globalism as totalitarianism.
Public policy and systems approach for global changes in disaster risks	1	Lecture and group work on public policy and systems approach for global changes in disaster risks.
Disaster risk management and governance for global changes	1	Lecture and group work on disaster risk management and governance for global changes.
Water-related disaster risk management	1	Discuss on water-related disaster risk management: concept and recent experiences.
Water cycle and climate change	1	Discuss on water cycle and climate change.
Presentation by students & discussions	4	Presentation by students related to this lectures and discussions on the presented topics.

Textbook   Nothing special.

Textbook(supplemental)   Nothing special.

Prerequisite(s)   Nothing special.

Independent Study Outside of Class   If handouts (teaching materials) are distributed (or downloaded from the website), students should read them prior to the class. They may be distributed at the classroom (or put on the website). Students can make use of them after the class for reviewing lectures and preparing presentation materials and discussion sessions which will be organized in the latter half of the semester.

Web Sites

Additional Information   This subject is compulsory for students enrolled in the Inter-Graduate School Program for Sustainable Development and Survivable Societies. Students other than ones in Graduate School of Engineering should submit a registration card for taking this class.

10i045

Exercise in Practical Scientific English

Code   10i045   Course Year   Master and Doctor Course   Term   1st term

Class day & Period   Thu 4th or 5th   Location   A2-304   Credits   1

Restriction   Up to 20 students for each class   Lecture Form(s)   Seminar   Language   Japanese and English

Instructor   Y. Nakayama and T. Mizuno

Course Description   Students learn about the basics of technical writing in English, and learn about and practice the format, style, and mechanics of the scientific research article. We may restrict the class size to enhance learning. The course is shared by Master's and Doctoral Course students.

Grading   Students are required to submit an initial report and a mid-term report. Students failing to submit the mid-term report will be given no credit.

Course Goals   Students develop basic communication skills needed to work for international organizations through practicing scientific English writing.

Course Topics

Theme	Class number of times	Description
Course Outline and Introduction to Technical Writing	1	Students examine the aim and requirements of the course, and look at the key points for writing correctly, clearly, and concisely. (The class schedule may change without notice.)
Basics of Technical Writing	3	Students learn about the definition and basic rules for technical writing, and look at common mistakes made by non-native writers of English. Students also learn about basic English grammar.
Japanese-to-English Translation Practice	3	Students learn about English grammar and practice revising their English writing.
Paragraphs	2	Students learn about paragraphs: the topic sentence and supporting sentences, and techniques for sequencing information in a paragraph.
Format of Research Articles	3	Students learn about the standard format of a research article: the title, abstract, method, results, discussion, and conclusion.
Listening Practice	1	Students practice listening comprehension using videos presenting scientific and technical information.
Online Learning	2	Writing Paragraphs

Textbook   No text − all materials are supplied by the teachers.

Textbook(supplemental)   Yukiko Nakayama, Gijutsu kei Eibun Raithingu Kyohon (Technical Writing Textbook), Japan Society for Technical Communication
Anne M. Coghill and Lorrin R. Garson, The ACS style guide, 3rd, The American Chemical Society.

Prerequisite(s)   Students need to have basic English skills at undergraduate level.

Independent Study Outside of Class

Web Sites   http://www.glc.t.kyoto-u.ac.jp/ja/study/grad/10d040

Additional Information   We may restrict the class size to enhance students' learning. Students who intend to join the course are required to attend the first-day guidance.

10K001

Introduction to Advanced Material Science and Technology   English lecture

Code   10K001   Course Year   Master and Doctor Course   Term   First term/Spring term   Class day & Period   Fri 5th   Location   A2-306   Credits   First term: 2, Spring term: 1.5

Restriction   No Restriction   Lecture Form(s)   Relay Lecture   Language   English

Instructor   GL Edu. Center, J. Assoc. Prof., Ryosuke Matsumoto

Related professors

Course Description   The various technologies used in the field of material science serve as bases for so-called "high technologies", and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

Grading   Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site for more information. You can find an attachment file, "   2016   ", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Hyperthermophiles and their thermostable biomolecules	1	This lecture will first introduce the diversity and classification of life. It will then focus on hyperthermophiles and their thermostable molecules, such as proteins, nucleic acids and lipids.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Theoretical Design for Organic Light-Emitting Diode Materials	1	Organic light-emitting diodes have multilayer structures consisting of carrier-transporting layers and a light emitting layer. The concepts employed in desining these materials and their examples are discussed.(T. Sato: Dept. of Molecular Engineering)
In Vivo Optical and Photoacoustic Tumor Imaging using Near-infrared Dye-cinjugated Amphiphilic Polymers	1	Optical and photoacoustic imaging methods are one of the most powerful and noninvasive techniques with which to visualize organs as well as tumor tissues. In this lecture,students can learn the basic principles of molecular imaging as well as recent progress in this field.(K. Ohe: Dept. of Energy and Hydrocarbon Chemistry)
Charge Carrier Transport in Conjugated Molecular Materials	1	How can we facilitate effective charge carrier transport pathway in organic conjugated molecular materials? The major topic of the present lecture is the mechanism of charge carrier transport in conjugated molecular materials. After an overview of electronic structure of conjugated molecular materials based on band models, a variety of measurement techniques is introduced to probe charge carrier mobility in the materials, to figure out characteristic behavior of conjugated molecules (and their aggregates) as electric conductive materials.(S. Seki: Dept. of Molecular Engineering)
Rheology Control by Associating Polymers	1	Hydrophobically modified water-soluble polymers (associating polymers) have been used as rheology modifiers or thickeners because rheological properties of solutions and dispersions are drastically changed by the addition of small amounts of associating polymers. In this lecture, recent development on the molecular origin of the structure formation and rheological properties of associating polymers will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Materials Processing using external fields for microstructure control	1	Properties of materials are not simply determined by atomic structure and chemical composition. Microstructure (crystal grain size, crystallographic orientation and so on) significantly influences the properties. Not a few techniques have been developed for controlling the microstructure. Materials processing using external fields will be demonstrated in this class.(H. Yasuda: Dept. of Materials Science and Engineering)
Force acting on colloidal particles	1	Colloid means small particles dispersed in a liquid solvent. Theoretical approaches on several forces acting on colloidal particles such as thermal, hydrodynamic, and electrostatic forces will be discussed.(R. Yamamoto: Dept. of Chemical Engineering)
Photonic Crystal Technology	1	Photonic crystals are materials with periodic modulation of refractive index, in which a frequency range that existence of photon is prohibited (i.e. photonic band gap) can be formed. In this class, basics and applications of photnic crystals are introduced.(T. Asano: Dept. of Electronic Science and Engineering)
Modern Organic Synthesis for Material Science	1	The lecture will deliver recent developments in organic synthesis, particularly focusing on catalytic reactions that have revolutionized chemical processes, and their applications in the production of some important pharmaceuticals and organic materials.(Y. Nakao: Dept. of Material Chemistry)
Physical Organic Chemistry of Supramolecular Photofunctional Organic Materials	1	This lecture explains interesting behaviors of photofunctional organic materials, such as photochromic compounds and fluorescence dyes, in the aggregated and self-organized state from the viewpoint of physical organic chemistry.(K. Matsuda: Dept. of Synthetic Chemistry and Biological Chemistry)
Introduction to Nuclear Materials	1	Nuclear materials are designed for using in irradiation field of neutron and high-energy particles. Some topics of nuclear transmutation, thermonuclear fusion, boron neutron capture therapy and others will be talked.(I. Takagi: Dept. of Nuclear Engineering)
Directed Self-Assembly (DSA) of Block Copolymers	1	Recently, Directed Self-Assembly (DSA) technology of block copolymers has received a lot of attention in the field of semiconductor research. In this lecture, the fundamentals of microphase separation of block copolymers and the application of DSA to lithographic technologies will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Oxide Magnetic Materials	1	The aim of the lecture is to review the fundamentals and applications of oxide magnetic materials. Main topics include fundamentals of magnetism, magnetic properties of oxides, magneto-optics of oxides, oxides for spintronics, and multiferroic oxides.(K. Tanaka: Dept. of Material Chemistry)
Solar Hydrogen Production using Semiconductor Photocatalyst	1	The development of a clean and renewable energy carrier that does not utilize fossil fuels is a great technological challenge. Photocatalytic water splitting using semiconductor materials has attracted considerable interest due to its potential to cleanly produce H2 from water by utilizing abundant solar light. In the present lecture, the basis and the recent progress in photocatalytic water splitting will be introduced.(R. Abe: Dept. of Energy and Hydrocarbon Chemistry)
Electrodeposition and Electroless Deposition for Materials Processing	1	(1)Fundamentals chemistry, electrochemistry, and thermodynamics , and (2)applications of electrodeposition and electroless deposition for materials processing.(K. Murase: Dept. of Materials Science and Engineering)

Textbook   None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Check the notice on the bulletin board.

Students who take Spring term (Lecture code 10H012) should attend first 11 lectures.

10K005

Advanced Modern Science and Technology　English lecture
（　　　　）

Code　10K005　Course Year　Master and Doctor Course　Term　　　Class day & Period　Thu 5th　Location　A2-306　Credits　2(Semester system)　Restriction　No Restriction

Lecture Form(s)　Relay Lecture　Language　English

Instructor　　　　　GL　　　　　Edu.　　　　　Center,　　　　J.　　　　Assoc.　　　　Prof.,　　　　Ryosuke　　　　Matsumoto　Related professors

Course Description　Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. In addition to the understanding of each technology, the attendances learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development. Group discussions will be done for further understanding of the topics of the course.

Grading　Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site. You can find an attachment file, "　　　　2016　　　　　　　　", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Who shake the dice?	1	Double slit phenomenon known as a prediction inability "quantum mechanics of the mystery (Feynman says)" can be every moment predicted by QED.(A. Tachibana: Dept. of Micro Engineering)
Exploration of Radiation Belts by Space Radio Engineering	1	Radiation belts of energetic particles are formed around magnetized planets such as the Earth, and they have been studied extensively by spacecraft missions and computer simulations for better understanding and utilization of the space plasma environment. We review historical development of space radio engineering and current understanding of radiation belt dynamics.(Y. Omura: Dept. of Electrical Engineering)
Systems Control in Aeronautics and Astronautics	1	Systems control theory is used in several problems in aeronautics and astronautics. This lecture focuses on some of them and further gives an overview of this research based on them.(K. Fujimoto: Dept. of Aeronautics and Astronautics)
Countermeasures of the Contaminated Water at Fukushima Daiichi Nuclear Power Station and that of the Contaminated Soil in Fukushima Area	1	The situation of contaminated water in Fukushima Daiichi Nuclear Power Station and soil contamination in and around Fukushima area and their technological countermeasures taken today will be introduced and discussed.(M. Yoneda: Dept. of Environmental Engineering)
Polymer Synthesis beyond the 21st Century: Precision Polymerizations and Novel Polymeric Materials	1	We are now in the "Polymer Age", where synthetic polymer materials are indispensable in the modern human life: healthy, safe, comfortable, and sustainable. A critical challenge herein is to develop "precision polymerization", polymer-forming reactions that provide polymers of well-defined structures and designed functions. Given these backgrounds, this lecture will overview the following subjects: (a)What polymers are; (b)How to synthesize polymers; (c)How and where polymeric materials work and function; (d)Precision polymer synthesis; and (e)The future of polymeric materials.(M. Sawamoto: Dept. of Polymer Chemistry)
Engineering Approach to Phase Behavior of Fluids Confined in Nanospace	1	Fluids confined in nano-scale pores exhibit peculiar phase behaviors that depends strongly on physico-chemical effects by pore walls and conditions of the bulk phase in equilibrium with the pore fluids, to which the engineering approach must be effective.(M. Miyahara: Dept. of Chemical Engineering)
Elucidation of Principles for the Self-organization of Mesoscale Colloidal Particles	1	The process of so-called the colloid crystal has been pursued to find out the key principles for the structure evolution, employing the Brownian dynamics simulations. Also given in the lecture will be various pattern formations in the convective self-assembly of colloidal suspensions.(M. Miyahara: Dept. of Chemical Engineering)
Architectural Design and Architectural Thinking	1	Architectural design is integration of thinking on architectural events and materials. I would like to discuss this architectural thinking and the method to embody it.(K. Takeyama: Dept. of Architecture and Architectural Engineering)
Genome sequences, what do they say and how can we use them?	1	Owing to the revolutionary advances in DNA sequencing technology, the complete genome sequences of a large number of organisms are now available. Here we will discuss what these genome sequences tell us and how we can use them to further increase our understanding of life.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Vacuum Nanoelectronics Devices in Harsh Environments	1	This lecture reviews the perspective of the modern vacuum electron devices based on miniaturized electron sources fabricated with contemporary semiconductor processes. The performance of the devices is evaluated in view of the device in harsh environments.(Y. Gotoh: Dept. of Electronic Science and Engineering)
Advanced Digital Technology for Analytical Recording of Cultural Heritage Assets	1	(A. Ide: Dept. of Mechanical Engineering and Science)
Protein Structure, Function, and Motion	1	Proteins work by fluctuating and changing their conformations. Protein structures and motions, which are essential for understanding their functions in detail, are introduced in conjunction with the state-of-art methods to analyze them.(K. Sugase: Dept. of Molecular Engineering)
Laser-induced Breakdown Spectroscopy and Its Application to Underwater In-situ Elemental Analysis	1	Development of laser-induced breakdown spectroscopy (LIBS) for in-situ elemental analysis in water, and the application to resource exploration at sea bottom will be explained.(T. Sakka: Dept. of Energy and Hydrocarbon Chemistry)
Micro- and Nano-scale Separations in Analytical Chemistry	1	Micro- and nano-scale high performance separation techniques, including capillary electrophoresis and microchip electrophoresis, will be discussed in terms of both fundamental characteristics and applications.(K. Otsuka: Dept. of Material Chemistry)
Modern Techniques for Material Characterization	1	Overview of modern techniques for material characterization is given with basic principles and practical applications. Impacts on the life of the people of characterization techniques are also included.(J. Matsuo: Dept. of Nuclear Engineering)

Textbook　None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information　Students who take Autumn term should register "Lecture code 10H006".

Frontiers in Modern Science & Technology

Code   10D051   Course Year   Master and Doctor Course   Term   Class day & Period   Wed 5th

Location Funai Hall   Credits   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Dimensional Control and Micro-Nano Systems

Code   10H403   Course Year   Master and Doctor Course   Term   Autumn   Class day & Period   Thu 1st

Location   A2-302   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Koji OTSUKA, Shunsaku KIMURA, Kiyotaka MIURA, Hiroshi KAGEYAMA, Takeshi ABE, Koichi EGUCHI, Yasujiro MURATA, Hajime TAMON, Shinji HASEBE, Kazuhiro MAE, Shuji MATSUSAKA

Course Description   This course focuses on the latest nano- and micro- technology on reaction mechanism, particle synthesis, structure control for solid catalyst, and reaction, separation, and analysis using nano- or micrometer sized devices.

Grading   Grades will be based on reports.

Course Goals   The goals of this course are to understand reaction mechanism and material transfer mechanism in nanoscale and to obtain ability to apply to practical reaction systems.

Course Topics

Theme	Class number of times	Description
1	1	New nanocarbon chemistry (Miura)
2	1	Hierarchical control of morphology and nanostructure of porous materials synthesized by sol-gel method (Tamon)
3	1	Analytical separations in micro-nano fields (Otsuka)
4	1	Intercalation chemistry of graphite (Abe)
5	1	Precise production of nano-particles using microreactor technology (Mae)
6	1	Femtosecond laser induced micro/nano structures and their applications (Miura)
7	1	Dimensional control in magnetic materials (Kageyama)
8	1	Monitoring and control of micro-chemical plants (Hasebe)
9	1	Dimension and morphology control of molecular assemblies (Kimura)
10	1	Design of active nanostructures for solid catalysts (Eguchi)
11	1	Control of particle motion in gases (Matsusaka)

Textbook   Handouts will be given in each lesson.

Textbook(supplemental)   Information will be given in each lesson.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   This course will be offered every two years; Not offered in 2017.

Molecular Function and Composite-Assembly Function

Code   10H404   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 1st

Location   A2-302   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Relay Lecture   Language   English

Instructor   H.Imahori,S.Kimura,Y.Tsuji,S.Seki,A.Ito,H.Kaji,T.Sato,K.Akagi,H.Ohkita,Y.Tsujii,K.Matsuda,

Course Description   Principles and their examples of revealing molecular function will be described based on molecular design. We also focus on guidelines of molecular design and their representative examples to achieve function of molecular composites and assemblies.

Grading   The grading will be done on a basis of your presence and assigments.

Course Goals   The goal of this course is to acquire abilities of proposing and performing research plans with regard to functions of molecular composites and assemblies by learning principles and their examples of revealing their molecular functions.

Course Topics

Theme	Class number of times	Description
Molecular function and composite-assembly function relating to light	1	This lecture describes photosynthesis and artificial photosynthesis as examples of molecular function and composite-assembly function relating to light. Organic photonics and electronics including molecular photovoltaics are also highlighted as potential practical applications (Imahori).
Electron mediating properties of molecular chains and molecular electronics	2	This lecture describes the electron transfer reaction through molecular chains having chromophores at molecular terminals. Not only the single molecule conductances but also the self-assembled monolayers will be introduced to obtain knowledge on molecular electronics (Kimura).
Molecular design for molecular magnetism	2	This lecture will describe the fundamental aspects of molecular magnetism, and show how the magnetic properties can be derived from knowledge of the molecular structures on the basis of various theoretical and experimental results (Ito).
Luminescence properties and self-assembly function of -conjugated polymers	2	This lecture describes luminescence properties and self-assembly function of -conjugated polymers by focusing on synthesis, polymerization, self-assembly, liquid crystallinity, alignment, helical structure, linear polarization and circular polarization (Akagi).
Interfacial functions of polymer brushes and their novel device application	2	This lecture aims at fundamental understandings of synthesis, structures, and chemical/physicochemical properties of polymer brushes and describes their novel application to e.g., tribology systems, solid electrolytes, and bio-interfaces (Tsujii).
Basics and recent developments of supramolecular photochemistry	2	This lecture describes basics and recent developments of supramolecular photochemistry for the design and synthesis of photo-functional materials (Matsuda).

Textbook   None

Textbook(supplemental)

Prerequisite(s)   Knowledge of an undergraduate level of chemistry as well as of English, especially listening and reading, is required.

Independent Study Outside of Class

Web Sites   None

Additional Information   This course has been changed from every two years to every year since 2015. Prof. Imahori has been a head of this course since 2009. A student who entered the course in 2014 and needs 2 credits rather than 1.5 credits should contact Prof. Imahori to get information on it.

10H407

Physical Chemistry and Analytical Techniques of Complex Systems

Code 10H407 Course Year Master and Doctor Course Term 2nd term Class day & Period Mon 5th

Location A2-304 Credits Restriction No Restriction Lecture Form(s) Relay Lecture

Language Japanese

Instructor K.Tanaka,T.Takigawa,T.Sakka,T Ohtsuki,T.Tanaka.H.Watanabe.T.Yoshizaki,T.Koga,T.Kanaya,R.Yamamoto,M.Miyahara,

Course Description This course focuses on fundamentals of physical chemistry for a quantitative understanding of structure, reaction, and properties of matters in complex systems. Analytical techniques including theoretical, numerical, and experimental approaches for clarification of the phenomena in complex systems are also introduced.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Frontiers in the Field of Chemical Biology and Biological Chemistry

Code   10H409   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 5th

Location   A2-302   Credits   Restriction   No Restriction   Lecture Form(s)   Relay Lecture

Language   English   Instructor   K. Akiyoshi,M.Shirakawa,Y.Tabata,I.Hamachi,Y.Mori,M.Umeda,H.Atomi,

Course Description   In the cutting-edge of reseach fields, chemistry and biologi are being closely related each other. In this class,progress in such interdisciplinary areas and topics including natural products, biophysics, bioimaging , baimaterials, regenerative medicine, microbiology, thermal biology, strucural biology, chemical biology, molecular physiology and others, are briefly explained and discussed.

Grading   Evaluation will be conducted by attendance and scores for excercises and problems that each lecturer charges in his topics

Course Goals   Students will be able to understand recent progress and trends in broad interdisciplinary areas between biology and chemistry and make their own ideas in these research fields from a viewpoint of indicvidual researchers and engineers.

Course Topics

Theme	Class number of times	Description
10/6-1/12	11	The guidance will be conducted at the first day of this class (Oct. 6th, 2015).

Textbook

Textbook(supplemental)

Prerequisite(s)   Fundamentals in chemistry, biochemistry, biology, and materials science.

Independent Study Outside of Class

Web Sites

Additional Information   The credit for MS2 students will be guided in detail at the first day.

Advances in Rechargeable Batteries

Code 10H415   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   A2-303   Credits   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Integrated Chemical Synthesis

Code 10H418 Course Year Master and Doctor Course Term every two years, open in H27 Class day & Period intesive course Location A2-303 Credits   Restriction No Restriction Lecture Form(s) Lecture Language English

Instructor Department of Synthetic Chemistry and Biological Chemistry, Professor, Jun-ichi Yoshida
Department of Synthetic Chemistry and Biological Chemistry, Lecturer, Aiichiro Nagaki

Course Description The course is aimed at developing a deeper understanding chemical reactions by taking advantage of the characteristic features of flow microreactorsspace integration of reactions using flow microreactors.
The course is not a compilation of all fields of flow microreactor synthesis, but it focuses on high-resolution reaction time control and fast micromixing. The topics discussed in this book would be sufficient to interest a wide range of students in this fascinating field of chemistry and to encourage them to try chemical synthesis using flow microreactors.

Grading examination

Course Goals To understand characteristic feaxtures of flow microreactor reactions and to get ability to design integrated synthesis using flow microreactors.

Course Topics

Theme	Class number of times	Description
Departure from Flask Chemistry	1	1.1 Introduction 1.2 Flow Reactors and Batch Reactors 1.3 Fluid Dynamics 1.4 Residence Time 1.5 Relationship between Residence Time and Reaction Time 1.6 How Reaction Proceeds in Batch Reactor 1.7 How Reaction Proceeds in Flow Reactor 1.8 How to Set Residence Time 1.9 Looking Forward
Controlling Residence Time	1	2.1 Introduction 2.2 Monitoring the Progress of a Reaction in a Flow Reactors: Inline Analysis 2.3 Monitoring the Progress of a Reaction in a Flow Reactors: Quench Flow Method 2.4 Generation and Reactions of Oxiranyllthiums: An Example of Quench Flow Method 2.5 General Consideration on Controlling Reactions Involving Unstable Intermediates 2.6 Temperature-Residence Time Mapping
Fast Micromixing	1	3.1 Introduction 3.2 What Is Mixing? 3.3 Mixing by Stirring 3.4 Mixing Using Micromixer 3.5 Measuring Mixing Efficiency or Speed
Use of Short-lived Reactive Specie	1	4.1 Introduction 4.2 Generation of Organometallic Species Containing Alkoxycarbonyl Groups 4.3 Decreasing the Reactivity of Organometallic Reagents to Increase Compatibility 4.4 Br − Li Exchange Reactions of Alkyl o-Bromobenzoates in a Batch Reactor 4.5 Br − Li Exchange Reactions of Alkyl o-Bromobenzoates in a Flow Microreactor 4.6 Br − Li Exchange Reactions of Alkyl p-Bromobenzoates in a Flow Microreactor 4.7 I − Li Exchange Reactions of Alkyl p-Iodobenzoates in a Flow Microreactor 4.8 Looking Forward
Protecting-group-free Synthesis	1	5.1 Introduction 5.2 Protecting Group 5.3 Reactions of Organometallic Reagents with Carbonyl Groups 5.4 Generation and Reaction of Aryllithium Species Bearing Ketone Carbonyl Groups
Controlling Isomerization	1	6.1 Introduction 6.2 Controlling Positional Isomers 6.3 Controlling Diastereomers 6.4 Controlling Stereoisomers (Enantiomers)
Controlling Competitive Consecutive Reactions	1	7.1 Introduction 7.2 Factors Determining Selectivity in Chemical Reactions 7.3 Competitive Consecutive Reactions 7.4 Disguised Chemical Selectivity 7.5 Controlling Selectivity of Friedel-Crafts Reactions Using Micromixing 7.6 CFD Simulations 7.7 Controlling Other Reactions Using Micromixing
Flash Chemistry	1	8.1 Introduction 8.2 What Is Flash Chemistry 8.3 Some Examples of Flash Chemistry 8.4 Scientific Merits 8.5 High Productivity and Impact on Industry
Space Integration of Reactions	1	9.1 Introduction 9.2 Integrating Reactions 9.3 Synthesizing o − Disubstituted Benzenes by Space Integration of Two Organolithium Reactions 9.4 Synthesizing TAC-101 by Integration of Three Organolithium Reactions 9.5 Space Integration of Halogen-lithium Exchange Reaction and Cross-Coupling Reaction
Polymerization	1	10.1 Introduction 10.2 Controlling Competitive Consecutive Reactions and Chain-Growth Polymerization 10.3 Chemistry of Cationic Polymerization 10.4 Flash Cationic Polymerization 10.5 Flash Anionic Polymerization 10.6 Other Polymerizations Using Flow Microreactor System
Summary and Outlook	1	

Textbook none

Textbook(supplemental)

Prerequisite(s) none

Independent Study Outside of Class

Web Sites

Additional Information

Integrated Chemical Processes

Code   10H420   Course Year   Master and Doctor Course   Term   Spring   Class day & Period   Mon 2nd
Location   A2-302   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English
Instructor   Professor Kazuhiro Mae, Department of Chemical Engineering

Professor Shinji Hasebe, Department of Chemical Engineering

Course Description   The basic concept of unit operation using micro space is explained. Then, the design and control strategies of new micro chemical plants are lectured.

Grading   Coursework will be graded based on reports, quiz in lecture, and examination.

Course Goals   A deeper understanding of the following points is the target of this course: 1)Understand the method of quantitative treatment of transport phenomena and mixing in micro space, 2)Based on the fundamental knowledge of micro chemical engineering explained above, acquire the skill of designing various types of micro reactors and micro mixers, 3)Understand the difference of micro chemical processes and conventional chemical processes, and acquire the skills of designing the operation and control systems.

Course Topics

Theme	Class number of times	Description
Waht is microreactor?	1	Preliminary exercises (for understanding students' knowledge level of chemical engineerinh). Explain merits and utilization concepts of microreactor with illustrating typical microreactor structure.
Trasport phenomena in micro space	2	Introduce how to treat quantitatively the transport phenomena in micro channel. Especially, explain the basic and modelling for heat transfer in micro channel. Finally, master the concept and design of micro heat exchanger.
Micro mixing	1	Starting from the logic of micro mixing, explain the design and operation factors of micr omixer with illustrating various micro mixers. Next, introduce the concept of micro mixing of immiscible fluids (liwuid/liquid and gas/liquid) for strict control of emulsion and bubble.
Micro reaction engineering	3	Introduce microreactors for organic synthesis, nano-particle production device, catalytic microreactor, and segmented flow microreactor with illustrating their drastic effect for quality control of products. Next, explain the methodology of design each reactor and its application.
Design of micro chemical process	2	The design method considering the feature of micro chemical plant is explained. Especially, the treatment as a system and the numbering-up methods are discussed.
Operation and control of micro chemical processes	2	The difference between the control scheme of the conventional plants and that of the micro plants is explained. Then, the operation and control methods of numbering-up process and the fault detection method of blocked device are explained.

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

Textbook(supplemental)

Prerequisite(s)   Basic knowledge for calculus, transport phenomena, chemical reaction enguneering, process control are required, but we consider to be able to understand for the students with no prior knowledge by introducing reference books.

Independent Study Outside of Class

Web Sites

Additional Information   Since contact matters will be notifid at KULASIS, register your e-mail address to KULASIS

Microbiology and Biotechnology

Microbiology and Biotechnology

Code   10H817   Course Year   Master and Doctor Course   Term   Autumn   Class day & Period   Wed 2nd

Location   A2-308   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Haruyuki Atomi, Tamotsu Kanai

Course Description   This lecture will introduce the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. Commonly used tools in the fields of biochemistry, molecular biology and genetics will also be discussed. In addition, methods to utilize cells and their enzymes in biotechnology will be introduced. Lectures will be given in English, with the aim to improve communication/discussion skills.

Grading   Grading will be based on presentations (60%) and attendance (40%).

Course Goals   Basic knowledge on the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. An understanding of the commonly used tools in the fields of biochemistry, molecular biology and genetics as well as methods to utilize cells and their enzymes in biotechnology. Lectures will be given in English, with the aim to improve communication/discussion skills.

Course Topics

Theme	Class number of times	Description
Introduction	1	Diversity of life, classification of organisms, structure and function of fundamental biomolecules.
Basic mechanisms to sustain life	3	Strategies to conserve energy, biosynthesis, cell division, cell differentiation.
Strategies to adapt to environmental conditions	2	Effect of environmental conditions on cells and biomolecules, thermophiles, acidophiles and their enzymes.
Protein engineering	2	Methods to study enzymes and enzyme reactions, methods to enhance their performance.
Cell engineering	2	Methods utilized in metabolic engineering, cell surface engineering, synthetic biology.
Topic discussion	1	Particular topics will be chosen for discussion

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H421

Design of Green Chemical Processing

&

Code   10H421   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 1st

Location   A2-306   Credits   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	5	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H424

Environmental-friendly Technology for Sound Material Cycle

Code   10H424   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 3rd

Location   C1-192   Credits   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   ,,,,,,

Course Description   Global warming, ecosystem crisis, and depletion of natural resources are of great concern today. To solve these problems, we have to build the sustainable society where low carbon dioxide emission, low environmental burdens, and the reduction of wastes by recycling are realized. It is possible to utilize municipal wastes, wastewaters, and unused biomass as resources instead of the natural resources used at present. Recycling-oriented technologies that enable sustainable utilization of those wastes and the concept to develop those technologies are introduced.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	5	
	3	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H459

Experimental Integrated Chemical Systems

Code 10H459   Course Year Master and Doctor Course   Term   Class day & Period   Location   Credits

Restriction   Lecture Form(s)   Language Japanese   Instructor J.Yoshida,S.Hasebe,K.Mae,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	3	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Laboratory and Exercise on Materials Engineering and Chemistry I

Code   10W432   Course Year   Master 1st   Term   1st term   Class day & Period   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W433

Laboratory and Exercise on Materials Engineering and Chemistry

Code   10W433   Course Year   Master 1st   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Laboratory and Exercise on Materials Engineering and Chemistry III

Code   10W434   Course Year   Master 2nd   Term   1st term   Class day & Period   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W435

Laboratory and Exercise on Materials Engineering and Chemistry IV

Code 10W435   Course Year   Master 2nd   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Laboratory and Exercise on Materials Engineering and Chemistry IV

Advanced Seminar on Materials Engineering and Chemistry I

Code   10W437   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W438

Advanced Seminar on Materials Engineering and Chemistry II

Code   10W438   Course Year   Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   No Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Seminar on Materials Engineering and Chemistry III

Code   10W439   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W440

Advanced Seminar on Materials Engineering and Chemistry IV

Code   10W440   Course Year   Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Seminar on Materials Engineering and Chemistry V

Code   10W441   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W442

Advanced Seminar on Materials Engineering and Chemistry VI

Code 10W442   Course Year Doctor Course   Term 2nd term   Class day & Period   Location   Credits

Restriction   Lecture Form(s)   Language Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Chemical Reaction Engineering, Adv.   English lecture

Chemical Reaction Engineering, Adv.

Code 10H009   Course Year Master and Doctor Course   Term   Class day & Period Fri 2nd   Location A2-305   Credits

Restriction   Lecture Form(s)   Language English

Instructor   Prof. Motoaki Kawase, Department of Chemical Engineering; Assoc. Prof. Hiroyuki Nakagawa, Department of Chemical Engineering

Course Description   This lecture is given in English. The following contents are covered: - Kinetic analysis of gas-solid-catalyst reaction, gas-solid reaction, and CVD reaction, - Operation and design of reactors for gas-solid-catalyst and gas-solid reactions, and - Industrial reactors including fixed bed, fluidized bed, moving bed, simulated moving bed, and stirred tank types.

Grading   Based on the result of examination at the end of term and the results of quizzes and reports imposed every week.

Course Goals   To understand kinetic analysis of chemical reactions utilized in the industry and procedure to design and operate industrial reactors.

Course Topics

Theme	Class number of times	Description
Gas-solid-catalyst reaction (1) Fundamentals	1	Commercial catalysts and industrial gas-solid-catalyst reactions are overviewed. Chemical reaction engineering fundamentals of the gas-solid-catalyst reaction is explained.
Gas-solid-catalyst reaction (2) Generalized effectiveness factor and selectivity in complex reactions	1	The generalized effectiveness factor and the selectivity affected by mass transfer are explained.
Gas-solid-catalyst reaction (3) Deactivation and regeneration of catalyst	2	Deactivation mechanisms of solid catalysts are overviewed. The deactivation and consequent change in selectivity are explained in terms of the decay function and specific activity.
Gas-solid-catalyst reaction (4) Design and operation of industrial catalytic reactors	1	Industrial catalytic reactors including fixed-bed and fluidized-bed reactors are overviewed. Design and operation of these reactors including thermal stability are explained.
Liquid-solid-catalyst reaction -- Simulated moving bed reactor	1	Concept and applications of simulated moving bed reactor are explained. Model-based analysis of simulated moving bed reactor is explained.
CVD reaction	2	Fundamentals of CVD reactions are explained from chemical reaction engineering view point. Kinetic analysis of CVD is described. Reaction models including elementary reaction model and overall reaction model are derived and applied to some examples.
Gas-solid reaction (1) Kinetic analysis	2	Kinetic measurement and analysis of complicated gas-solid reactions, particularly coal pyrolysis, are explained with the first-order reaction model to the distributed activation energy model (DAEM).
Gas-solid reaction (2) Kinetic analysis of gas-solid reaction	1	Concepts and derivation of the reaction models including the grain model and the random-pore model are explained. Application of the models to coal gasification is overviewed.

Textbook   Prints are hand out at the class.

Textbook(supplemental)

Prerequisite(s)   Needs knowledge of chemical reaction engineering including heterogeneous reactions.

Independent Study Outside of Class

Web Sites

Additional Information

10H003

Advanced Topics in Transport Phenomena　English lecture

Advanced Topics in Transport Phenomena

Code　10H003　Course Year　Master and Doctor Course　Term　Spring term

Class day & Period　Tue 4th　Location　A2-305　Credits　1.5　Restriction　No Restriction

Lecture Form(s)　Lecture　Language　English

Instructor　Department of Chemical Engineering, Professor, Ryoichi Yamamoto

Course Description　After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on "Langevin Equation", "Hydrodynamic Interaction", and "Linear Response Theory" will also be given.

Grading　Answers to several questions and exercises, which will be given during the course, are used to judge.

Course Goals　To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

Course Topics

Theme	Class number of times	Description
- Polymeric Liquids / Rheology	6	Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation	3	To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction	2	To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.
Understanding Check	1	

Textbook　Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

Textbook(supplemental)　Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowlter, (Cambridge)

Prerequisite(s)　Under graduate level basic knowledge on "Fluid Mechanics / Transport Phenomena" and basic mathematics including "Vector Analyses" are required.

Independent Study Outside of Class

Web Sites

Additional Information

Mathematics and Numerical Computing

Mathematics and Numerical Computing

Code   10H444   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period

Location   A2-306   Credits   1.5   Restriction   Lecture Form(s)   Seminar and Exercise   Language   English

Instructor   Department of Chemical Engineering, Prof. Ohshima (representative) and Department Staffs who are experts of numerical simulations.

Course Description   This class offers an introductory course of numerical computing with MATLAB, which is a world widely renowned scientific computing software. We want the students learn how to make a program code through several numerical calculation examples in chemistry and chemical engineering. At the last, the students are encouraged to use the MATLAB for solving the numerical problem that each students have in their thesis researches.

Grading   Attendance and Project Reports

Course Goals   The aim of this course is to understand the MATLAB programming code and to make a own code for a simple numerical computing problems. Through exercising the programming, basic concept of several numerical computing scheme, such as Newton method, Euler, RKG, Finite Difference, etc., will be taught.

Course Topics

Theme	Class number of times	Description
Introduction of Matlab	1	Learn how to Get started. Learn the Basic Manipulation of matrix and vectors. Understanding of m-files and How to write if and for statements with Matlab.
Solve Algebraic Equations	2	Learn how to solve several Linear and Nonlinear Algebraic Equations. Some calculation methods, like Newton, Scant methods are reviewed. Equation of State, Flash Calculation, Hydrogen for Fuel Cell, Equilibrium Reaction are used for example problems for computing.
Solve Ordinery Differential Equations	3	Learn how to solve ordinary differential equations. Class starts withe single equation to multiple multi-variable differential equation. Euler and RKG methods are introduced as the typical numerical calculation schemes. Plug flow reactor, batch reactor design and simulations are considered as examples of numerical calculation.
Introduce and Discuss own Numerical Computing Research Topics	1	Students are requested to make a presentation on their research topics that can have any numerical computing issues. Discuss whether Matlab can be applicable for solving the issues.
Data Analysis	2	Learn how to deal with big experimental data and extract the information. Least square method and FFT are introduced. Near Infrared Spectral or Plant data will be provided to analyze with the Matlab coded by themselves.
Solve Partial Differential Equations	2	Learn how to solve a typical parabolic differential equation. Learn Finite difference (Explicit and Implicit schemes. Heat conduction and flow in tube are execized.

Textbook   Handout from tutors

Textbook(supplemental)   Informed accordingly

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

English for Debate and Communications

English for Debate and Communications

Code   10H446   Course Year   Master and Doctor Course   Term   2nd term

Class day & Period   6 weeks of intensive classes (practice)   4 hours per one week

Location   A3 -025 Seminar Room   Credits   1.5

Restriction   Maximum number of students accepted for the class is 8   Lecture Form(s)   Seminar and Exercise

Language   English

Instructor   Dr.   Mike   Sullivan,   Lingauge   Intercom   Corporation   Dept of Chemical Engineering, Prof. M. Ohshima

Course Description   The course is built up with 6 units. Through these six units one by one, the students can learn how to give, explain, organize their own opinion and conduct the debate.

Grading   Attendance and performance in the class

Course Goals   Learn the basic and key phrases of active listening, interrupting, clarifying and confirming, paraphrasing, hesitating, and showing your understanding. After discussion and simulation of debating, debate is conducted for given questions.

Course Topics

Theme	Class number of times	Description
Unit 1: Giving Your Opinion	2	Discussion Focus/ Key points Language Focus 1; Active Listening, Hesitating Practice Language Focus 2: Opinions/suggestion Putting them together. Discussion and Simulations. Debate Question of the Week 1
Unit 2: Explaining Your Opinion	2	Discussion Focus/ Key points Topic Sentence, Primary Sentence, Debatable/No-debatable Practice Primary Supporting Sentence Practice Connecting Words & Practice Discussion and Simulation. Debate Question of the Week 2
Unit 3: Organizing Your Opinion	2	Discussion Focus/ Key points Secondary Supporting Sentence Developing and Argument Practice Putting them together. Discussion and Simulations. Debate Question of the Week 3
Unit 4: Interrupting/Refuting Opinions	2	Discussion Focus/ Key points Interrupting, Interrupting Practice Refuting Opinions, Refutation Practice Discussion and Simulations. Debate Question of the Week 4
Unit 5:Challenging Support	2	Discussion Focus/ Key points Persuading Language, Making Proposals Practice Speaking Practice Challenging and Defending Language Discussion and Simulations. Debate Question of the Week 5
Unit 6: Delivery/Performance	2	Discussion Focus/ Key points Persuasive Language Delivery Focus: Word/Sentence Stress. Intonation Discussion and Simulations. Debate Question of the Week 6

Textbook   a in-house booklet be provided

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Japan Gateway Project Seminar

JGP

Code   10P448   Course Year   Master and Doctor Course   Term   1st+2nd term

Class day & Period   Announced before opening the course   Location   Announced before opening the course

Credits   0.5   Restriction   No Restriction   Lecture Form(s)   Intensive Lecture   Language   English

Instructor   C-PIER, Distinguished visiting project professor
6 chemistry-related departments, Professors related to the subjects

Course Description   This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.

Grading   Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.

Course Goals   Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.

Course Topics

Theme	Class number of times	Description

Textbook   A copy of related contents is offered.

Textbook(supplemental)   Announced in the lecture.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.

Japan Gateway Project Seminar

JGP

Code   10P450   Course Year   Master and Doctor Course   Term   1st+2nd term

Class day & Period   Announced before opening the course   Location   Announced before opening the course

Credits   0.5   Restriction   No Restriction   Lecture Form(s)   Intensive Lecture   Language   English

Instructor   C-PIER, Distinguished visiting project professor

6 chemistry-related departments, Professors related to the subjects

Course Description   This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.

Grading   Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.

Course Goals   Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.

Course Topics

Theme	Class number of times	Description

Textbook   A copy of related contents is offered.

Textbook(supplemental)   Announced in the lecture.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.

Japan Gateway Project Seminar
JGP

Code   10P452   Course Year   Master and Doctor Course   Term   1st+2nd term

Class day & Period   Announced before opening the course   Location   Announced before opening the course

Credits   0.5   Restriction   No Restriction   Lecture Form(s)   Intensive Lecture   Language   English

Instructor   C-PIER, Distinguished visiting project professor
6 chemistry-related departments, Professors related to the subjects

Course Description   This is a series of lectures which are carried out by the professors who are invited with Japan Gateway: Kyoto University Top Global Program (JGP). By attending a lecture from the world top level professors, this course aims to grasping the newest trend of the specific field and extending the view of thinking.

Grading   Attendance at a series of four lectures or more is requested. The report assigned in the lecture and/or the result of final examination are used for evaluation.

Course Goals   Understand the fundamental and/or latest contents of a field of chemistry or chemical engineering in English, and obtain the skill of discussing the related contents in English.

Course Topics

Theme	Class number of times	Description

Textbook   A copy of related contents is offered.

Textbook(supplemental)   Announced in the lecture.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Professors of the faculty of engineering who are doing similar research support a student's study. In some cases, this course consists of a series of lectures by two or more researchers.

Japan Gateway Project Seminar

JGP

Code   10P454   Course Year   Master and Doctor Course   Term   2016/   1st+2nd term   Class day & Period

Location   Credits   Restriction   No Restriction   Lecture Form(s)   Intensive Lecture   Language   English

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Japan Gateway Project Seminar

JGP

Code   10P454   Course Year   Master and Doctor Course   Term   2016/   1st+2nd term   Class day & Period

Japan Gateway Project Seminar

JGP

Code   10P456   Course Year   Master and Doctor Course   Term   2016/ 1st+2nd term   Class day & Period

Location   Credits   Restriction No Restriction   Lecture Form(s) Intensive Lecture   Language English

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Japan Gateway Project Seminar

JGP

Code   10P456   Course Year   Master and Doctor Course   Term   2016/ 1st+2nd term   Class day & Period

Japan Gateway Project Seminar

JGP

Code 10P457   Course Year Master and Doctor Course   Term 2016/ 1st+2nd term   Class day & Period

Location   Credits   Restriction No Restriction   Lecture Form(s) Intensive Lecture   Language English

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Japan Gateway Project Seminar

JGP

Code 10P457   Course Year Master and Doctor Course   Term 2016/ 1st+2nd term   Class day & Period

Location   Credits   Restriction No Restriction   Lecture Form(s) Intensive Lecture   Language English

Japan Gateway Project International Internship

JGP   I

Code 10P458 Course Year Master and Doctor Course Term 1st+2nd term Class day & Period

Location Credits 0.5 Restriction Limited to the students in Pre-super global course

Lecture Form(s) Exercise Language English

Instructor Faculty members of Chemistry and Chemical Engineering Subunit in JGP

Course Description At the overseas cooperation university in JGP project, a research-based internship of one month is executed. Through the internship, study how to proceed the research at the advanced universities, and improve the English communication ability.

Grading The content of presentation and the presentation skill are evaluated at the seminar which will be executed after the internship.

Course Goals This course aims to understand the way of managing the research at the foreign university, and obtain the communication skills by which they can argue the details of research with foreign researchers.

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information By the limitation of budget for each year, the number of students will be restricted.

Japan Gateway Project International Internship II

JGP

Code   10H460   Course Year   Master and Doctor Course   Term   1st+2nd term   Class day & Period

Location   Credits   1   Restriction   Limited to the students in Pre-super global course

Lecture Form(s)   Exercise   Language   English

Instructor   Faculty members of Chemistry and Chemical Engineering Subunit in JGP

Course Description   At the overseas cooperation university in JGP project, a research-based internship of two months is executed. Through the internship, study how to proceed the research at the advanced universities, and improve the English communication ability.

Grading   The content of presentation and the presentation skill are evaluated at the seminar which will be executed after the internship.

Course Goals   This course aims to understand the way of managing the research at the foreign university, and obtain the communication skills by which they can argue the details of research with foreign researchers.

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   By the limitation of budget for each year, the number of students will be restricted.

Japan Gateway Project International Internship
JGP

Code 10H462   Course Year Master and Doctor Course   Term 1st+2nd term   Class day & Period

Location   Credits 1.5   Restriction Limited to the students in Pre-super global course

Lecture Form(s) Exercise   Language English

Instructor Faculty members of Chemistry and Chemical Engineering Subunit in JGP

Course Description At the overseas cooperation university in JGP project, a research-based internship of more than three months is executed. Through the internship, cultivate the abilities of communication with foreign researchers, management of a research, and writing research papers.

Grading The content of presentation and the presentation skill are evaluated at the seminar which will be executed after the internship.

Course Goals This course aims to acquire the skills of communicating with foreign researchers, managing the research, and writing academic papers.

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information By the limitation of budget for each year, the number of students will be restricted.

Frontiers in Modern Science & Technology

Code   10D051   Course Year   Master and Doctor Course   Term   Class day & Period   Wed 5th

Location Funai Hall   Credits   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Exercise in Practical Scientific English

Code   10i045   Course Year   Master and Doctor Course   Term   1st term

Class day & Period   Thu 4th or 5th   Location   A2-304   Credits   1

Restriction   Up to 20 students for each class   Lecture Form(s)   Seminar   Language   Japanese and English

Instructor   Y. Nakayama and T. Mizuno

Course Description   Students learn about the basics of technical writing in English, and learn about and practice the format, style, and mechanics of the scientific research article. We may restrict the class size to enhance learning. The course is shared by Master's and Doctoral Course students.

Grading   Students are required to submit an initial report and a mid-term report. Students failing to submit the mid-term report will be given no credit.

Course Goals   Students develop basic communication skills needed to work for international organizations through practicing scientific English writing.

Course Topics

Theme	Class number of times	Description
Course Outline and Introduction to Technical Writing	1	Students examine the aim and requirements of the course, and look at the key points for writing correctly, clearly, and concisely. (The class schedule may change without notice.)
Basics of Technical Writing	3	Students learn about the definition and basic rules for technical writing, and look at common mistakes made by non-native writers of English. Students also learn about basic English grammar.
Japanese-to-English Translation Practice	3	Students learn about English grammar and practice revising their English writing.
Paragraphs	2	Students learn about paragraphs: the topic sentence and supporting sentences, and techniques for sequencing information in a paragraph.
Format of Research Articles	3	Students learn about the standard format of a research article: the title, abstract, method, results, discussion, and conclusion.
Listening Practice	1	Students practice listening comprehension using videos presenting scientific and technical information.
Online Learning	2	Writing Paragraphs

Textbook   No text – all materials are supplied by the teachers.

Textbook(supplemental)   Yukiko Nakayama, Gijutsu kei Eibun Raithingu Kyohon (Technical Writing Textbook), Japan Society for Technical Communication
Anne M. Coghill and Lorrin R. Garson, The ACS style guide, 3rd, The American Chemical Society.

Prerequisite(s)   Students need to have basic English skills at undergraduate level.

Independent Study Outside of Class

Web Sites   http://www.glc.t.kyoto-u.ac.jp/ja/study/grad/10d040

Additional Information   We may restrict the class size to enhance students' learning. Students who intend to join the course are required to attend the first-day guidance.

10K001

Introduction to Advanced Material Science and Technology   English lecture

Code   10K001   Course Year   Master and Doctor Course   Term   First term/Spring term   Class day & Period   Fri 5th   Location   A2-306   Credits   First term: 2, Spring term: 1.5

Restriction   No Restriction   Lecture Form(s)   Relay Lecture   Language   English

Instructor   GL Edu. Center, J. Assoc. Prof., Ryosuke Matsumoto

Related professors

Course Description   The various technologies used in the field of material science serve as bases for so-called "high technologies", and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

Grading   Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site for more information. You can find an attachment file, "   2016   ", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Hyperthermophiles and their thermostable biomolecules	1	This lecture will first introduce the diversity and classification of life. It will then focus on hyperthermophiles and their thermostable molecules, such as proteins, nucleic acids and lipids.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Theoretical Design for Organic Light-Emitting Diode Materials	1	Organic light-emitting diodes have multilayer structures consisting of carrier-transporting layers and a light emitting layer. The concepts employed in desining these materials and their examples are discussed.(T. Sato: Dept. of Molecular Engineering)
In Vivo Optical and Photoacoustic Tumor Imaging using Near-infrared Dye-cinjugated Amphiphilic Polymers	1	Optical and photoacoustic imaging methods are one of the most powerful and noninvasive techniques with which to visualize organs as well as tumor tissues. In this lecture,students can learn the basic principles of molecular imaging as well as recent progress in this field.(K. Ohe: Dept. of Energy and Hydrocarbon Chemistry)
Charge Carrier Transport in Conjugated Molecular Materials	1	How can we facilitate effective charge carrier transport pathway in organic conjugated molecular materials? The major topic of the present lecture is the mechanism of charge carrier transport in conjugated molecular materials. After an overview of electronic structure of conjugated molecular materials based on band models, a variety of measurement techniques is introduced to probe charge carrier mobility in the materials, to figure out characteristic behavior of conjugated molecules (and their aggregates) as electric conductive materials.(S. Seki: Dept. of Molecular Engineering)
Rheology Control by Associating Polymers	1	Hydrophobically modified water-soluble polymers (associating polymers) have been used as rheology modifiers or thickeners because rheological properties of solutions and dispersions are drastically changed by the addition of small amounts of associating polymers. In this lecture, recent development on the molecular origin of the structure formation and rheological properties of associating polymers will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Materials Processing using external fields for microstructure control	1	Properties of materials are not simply determined by atomic structure and chemical composition. Microstructure (crystal grain size, crystallographic orientation and so on) significantly influences the properties. Not a few techniques have been developed for controlling the microstructure. Materials processing using external fields will be demonstrated in this class.(H. Yasuda: Dept. of Materials Science and Engineering)
Force acting on colloidal particles	1	Colloid means small particles dispersed in a liquid solvent. Theoretical approaches on several forces acting on colloidal particles such as thermal, hydrodynamic, and electrostatic forces will be discussed.(R. Yamamoto: Dept. of Chemical Engineering)
Photonic Crystal Technology	1	Photonic crystals are materials with periodic modulation of refractive index, in which a frequency range that existence of photon is prohibited (i.e. photonic band gap) can be formed. In this class, basics and applications of photnic crystals are introduced.(T. Asano: Dept. of Electronic Science and Engineering)
Modern Organic Synthesis for Material Science	1	The lecture will deliver recent developments in organic synthesis, particularly focusing on catalytic reactions that have revolutionized chemical processes, and their applications in the production of some important pharmaceuticals and organic materials.(Y. Nakao: Dept. of Material Chemistry)
Physical Organic Chemistry of Supramolecular Photofunctional Organic Materials	1	This lecture explains interesting behaviors of photofunctional organic materials, such as photochromic compounds and fluorescence dyes, in the aggregated and self-organized state from the viewpoint of physical organic chemistry.(K. Matsuda: Dept. of Synthetic Chemistry and Biological Chemistry)
Introduction to Nuclear Materials	1	Nuclear materials are designed for using in irradiation field of neutron and high-energy particles. Some topics of nuclear transmutation, thermonuclear fusion, boron neutron capture therapy and others will be talked.(I. Takagi: Dept. of Nuclear Engineering)
Directed Self-Assembly (DSA) of Block Copolymers	1	Recently, Directed Self-Assembly (DSA) technology of block copolymers has received a lot of attention in the field of semiconductor research. In this lecture, the fundamentals of microphase separation of block copolymers and the application of DSA to lithographic technologies will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Oxide Magnetic Materials	1	The aim of the lecture is to review the fundamentals and applications of oxide magnetic materials. Main topics include fundamentals of magnetism, magnetic properties of oxides, magneto-optics of oxides, oxides for spintronics, and multiferroic oxides.(K. Tanaka: Dept. of Material Chemistry)
Solar Hydrogen Production using Semiconductor Photocatalyst	1	The development of a clean and renewable energy carrier that does not utilize fossil fuels is a great technological challenge. Photocatalytic water splitting using semiconductor materials has attracted considerable interest due to its potential to cleanly produce H_2 from water by utilizing abundant solar light. In the present lecture, the basis and the recent progress in photocatalytic water splitting will be introduced.(R. Abe: Dept. of Energy and Hydrocarbon Chemistry)
Electrodeposition and Electroless Deposition for Materials Processing	1	(1)Fundamentals chemistry, electrochemistry, and thermodynamics , and (2)applications of electrodeposition and electroless deposition for materials processing.(K. Murase: Dept. of Materials Science and Engineering)

Textbook   None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Check the notice on the bulletin board.

Students who take Spring term (Lecture code 10H012) should attend first 11 lectures.

10K005

Advanced Modern Science and Technology　English lecture
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Code　10K005　　Course Year　Master and Doctor Course　　Term　　　Class day & Period　Thu 5th　Location　A2-306　　Credits　2(Semester system)　Restriction　No Restriction

Lecture Form(s)　Relay Lecture　Language　English

Instructor　　　　GL　　　　　Edu.　　　　　Center,　　　　　J.　　　　　Assoc.　　　　　Prof.,　　　　　Ryosuke　　　　　Matsumoto
Related professors

Course Description　Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. In addition to the understanding of each technology, the attendances learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development. Group discussions will be done for further understanding of the topics of the course.

Grading　Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site. You can find an attachment file, "　　　　2016　　　　　　　　", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Who shake the dice?	1	Double slit phenomenon known as a prediction inability "quantum mechanics of the mystery (Feynman says)" can be every moment predicted by QED.(A. Tachibana: Dept. of Micro Engineering)
Exploration of Radiation Belts by Space Radio Engineering	1	Radiation belts of energetic particles are formed around magnetized planets such as the Earth, and they have been studied extensively by spacecraft missions and computer simulations for better understanding and utilization of the space plasma environment. We review historical development of space radio engineering and current understanding of radiation belt dynamics.(Y. Omura: Dept. of Electrical Engineering)
Systems Control in Aeronautics and Astronautics	1	Systems control theory is used in several problems in aeronautics and astronautics. This lecture focuses on some of them and further gives an overview of this research based on them.(K. Fujimoto: Dept. of Aeronautics and Astronautics)
Countermeasures of the Contaminated Water at Fukushima Daiichi Nuclear Power Station and that of the Contaminated Soil in Fukushima Area	1	The situation of contaminated water in Fukushima Daiichi Nuclear Power Station and soil contamination in and around Fukushima area and their technological countermeasures taken today will be introduced and discussed.(M. Yoneda: Dept. of Environmental Engineering)
Polymer Synthesis beyond the 21st Century: Precision Polymerizations and Novel Polymeric Materials	1	We are now in the "Polymer Age", where synthetic polymer materials are indispensable in the modern human life: healthy, safe, comfortable, and sustainable. A critical challenge herein is to develop "precision polymerization", polymer-forming reactions that provide polymers of well-defined structures and designed functions. Given these backgrounds, this lecture will overview the following subjects: (a)What polymers are; (b)How to synthesize polymers; (c)How and where polymeric materials work and function; (d)Precision polymer synthesis; and (e)The future of polymeric materials.(M. Sawamoto: Dept. of Polymer Chemistry)
Engineering Approach to Phase Behavior of Fluids Confined in Nanospace	1	Fluids confined in nano-scale pores exhibit peculiar phase behaviors that depends strongly on physico-chemical effects by pore walls and conditions of the bulk phase in equilibrium with the pore fluids, to which the engineering approach must be effective.(M. Miyahara: Dept. of Chemical Engineering)
Elucidation of Principles for the Self-organization of Mesoscale Colloidal Particles	1	The process of so-called the colloid crystal has been pursued to find out the key principles for the structure evolution, employing the Brownian dynamics simulations. Also given in the lecture will be various pattern formations in the convective self-assembly of colloidal suspensions.(M. Miyahara: Dept. of Chemical Engineering)
Architectural Design and Architectural Thinking	1	Architectural design is integration of thinking on architectural events and materials. I would like to discuss this architectural thinking and the method to embody it.(K. Takeyama: Dept. of Architecture and Architectural Engineering)
Genome sequences, what do they say and how can we use them?	1	Owing to the revolutionary advances in DNA sequencing technology, the complete genome sequences of a large number of organisms are now available. Here we will discuss what these genome sequences tell us and how we can use them to further increase our understanding of life.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Vacuum Nanoelectronics Devices in Harsh Environments	1	This lecture reviews the perspective of the modern vacuum electron devices based on miniaturized electron sources fabricated with contemporary semiconductor processes. The performance of the devices is evaluated in view of the device in harsh environments.(Y. Gotoh: Dept. of Electronic Science and Engineering)
Advanced Digital Technology for Analytical Recording of Cultural Heritage Assets	1	(A. Ide: Dept. of Mechanical Engineering and Science)
Protein Structure, Function, and Motion	1	Proteins work by fluctuating and changing their conformations. Protein structures and motions, which are essential for understanding their functions in detail, are introduced in conjunction with the state-of-art methods to analyze them.(K. Sugase: Dept. of Molecular Engineering)
Laser-induced Breakdown Spectroscopy and Its Application to Underwater In-situ Elemental Analysis	1	Development of laser-induced breakdown spectroscopy (LIBS) for in-situ elemental analysis in water, and the application to resource exploration at sea bottom will be explained.(T. Sakka: Dept. of Energy and Hydrocarbon Chemistry)
Micro- and Nano-scale Separations in Analytical Chemistry	1	Micro- and nano-scale high performance separation techniques, including capillary electrophoresis and microchip electrophoresis, will be discussed in terms of both fundamental characteristics and applications.(K. Otsuka: Dept. of Material Chemistry)
Modern Techniques for Material Characterization	1	Overview of modern techniques for material characterization is given with basic principles and practical applications. Impacts on the life of the people of characterization techniques are also included.(J. Matsuo: Dept. of Nuclear Engineering)

Textbook　None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information　Students who take Autumn term should register "Lecture code 10H006".

10i005

Business Japanease I

Code   10i005   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 2nd

Location   B-Cluster 2F Seminar Room   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Lect. Katoh,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Business Japanease II

II

Code   10i006   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   B-Cluster 2F Seminar Room   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Lect. Katoh,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Professional Scientific Presentation Exercises English lecture

Code 10i041 Course Year Doctor Course Term 1st term Class day & Period Wed 5th

Location B-Cluster 2F Seminar Room Credits 1

Restriction The number of students might be limited if too many students will get enrolled.

Lecture Form(s) Semina Language English

Instructor Juha Lintuluoto, Associate Professor, Department of Synthetic Chemistry and Biological Chemistry

Course Description It is imperative for future engineers to be able to communicate and deliver effectively scientific information to large variety of audiences. This skill enables engineers to share and absorb information to more extended audiences, and facilitates success in selling ideas and products, publishing and team working. The purpose of this course is to teach the basic rules needed for successful professional scientific presentation, both orally and written. The course also prepares students to deliver scientific information presentations to wide audiences. The course is consisted of excessive exercises, of which the student should complete seven (7) tasks. The course holds 3-4 tasks for oral presentation exercises, and 3-4 tasks for professional scientific writing exercises. The exact number of both exercises is adjusted for each student's needs. The course is aimed for doctor course (DC) students, both Japanese and Foreign nationals

Grading Reports, class activity, presentation

Course Goals This course is aimed to foster engineering students' scientific presentation skills. The successfully course completed students will be able to express and present complicated and specific scientific information at more generally understandable level. The students will also be able to pose relevant questions and effectively answer to the wide variety of questions.

Course Topics

Theme	Class number of times	Description
	1	Guidance and Professional presentation rules and etiquette
	3	Oral presentations & questioning I, Written report I
	3	Oral presentations & questioning I, Written report I
	3	Oral presentations & questioning II, Written report II
	3	Oral presentations & questioning II, Written report II
	2	Oral presentations & questioning III, Written report III
		Oral presentations & questioning III, Written report III
		Oral presentations & questioning IV, Written report IV
		Oral presentations & questioning IV, Written report IV I
		Course summary and discussion

Textbook Course materials will be provided.

Textbook(supplemental) Will be informed if necessary.

Prerequisite(s) -Fundamental skills about scientific presentation

-Advanced English skills

-Sufficient personal research results

Independent Study Outside of Class

Web Sites The web-site is listed in the home page of the GL education center.

Additional Information Students are requested to check in advance whether the credit of this course is counted as the unit for graduation requirement at department level. Course starts at April 13th, and the 1st lesson is repeated on April 20th. The course schedule is irregular. Most classes are biweekly, the detailed schedule is provided at the 1st lecture.

10i042

Advanced Engineering and Economy　English lecture

Code　10i042　Course Year　Master and Doctor Course　Term　1st term　Class day & Period　Tue 5th　Location　B-Cluster 2F Seminar Room

Credits　2　Restriction　The number of students might be limited if too many students will get enrolled.

Lecture Form(s)　Lectures, Group works&tasks　Language　English

Instructor　Juha Lintuluoto, Associate Professor, Department of Synthetic Chemistry and Biological Chemistry

Course Description　Engineering economics plays central role in any industrial engineering project. For an engineer, it is important to apply the engineering know-how with the economic analysis skills to obtain the best available materials, methods, devices, etc. in the most economical way. This course is aimed to teach engineering students the basic economic methods to manage economically an engineering project. In addition, the report writing on various engineering economic issues prepares to write reports in a professional form. The lab sessions are meant for the verbal skills improvement as well as improvement of analytical thinking. The topics are of current relevant topics Small-group brain-storming method is used. The exercise sessions cover the use of Ms-Excel for various quantitative economic analyses.

Grading　Final test, reports, class activity

Course Goals　This course is aimed to strengthen engineering students' skills in economics. The course concept is to teach students selectively those subjects which serve as major tools to solve economic tasks in engineering environment. The reports and lab sessions provide students stimulating and analytical thinking requiring tasks, and presentation skills training is an important part of this course.

Course Topics

Theme	Class number of times	Description
Student orientation and Introduction to engineering economy	1	
Cost concepts and design economics	1	
Cost estimation techniques	1	
The time value of money	1	
Evaluating a single project	1	
Comparison and selection among alternatives	1	
Depreciation and income taxes	1	
Price changes and exchange rates	1	
Replacement analysis	1	
Evaluating projects with the benefit-cost ratio method	1	
Breakeven and sensitivity analysis	1	
Probabilistic risk analysis	1	
The capital budgeting process	1	
Decision making considering multiattributes	1	
Final test	1	
		Additionally, students will submit five reports during the course on given engineering economy subjects. Also, required are the five lab participations (ca.60 min/each) for each student. Additionally, three exercise sessions (ca.60 min/each), where use of Ms-Excel will be practiced for solving various engineering economy tasks, should be completed

Textbook　Engineering Economy 15th ed. William G. Sullivan (2011)

Textbook(supplemental)　Will be informed if necessary.

Prerequisite(s)　-This course is highly recommended for those who attend " Engineering Project Management" course , Small group working method

Independent Study Outside of Class

Web Sites　The web-site is listed in the home page of the GL education center.

Additional Information　Students are requested to check in advance whether the credits of this course are counted as the units for graduation requirement at department level. The course starts on Apr.12th.

10i047

Engineering Project Management   English lecture

Code   10i047   Course Year   Doctor Course   Term   1st term   Class day & Period   Fri 4th   Location   B-Cluster 2F Seminar Room

Credits   1   Restriction   Lecture Form(s)   Lectures, Group works&tasks   Language   English

Instructor   GL center: J.Assoc.Prof. Takatori, Mizuno, Tanaka, Matumoto

Assoc.Prof. Lintuluoto, J. Assoc.Prof. Nishi

Course Description   The purpose of this course is to teach the basic skills needed for expressing and initiating ideas, and presenting information in successful international engineering group work. The course provides simulations for students in group managing and decision making in international engineering teams. International teamwork ethics subjects for successful engineering project will be practiced. The course consists of lectures, case studies, the invited lecture from an industry representative and the final examination. Also, a project report exercise is included in this course.

The course is basically designed for doctor course (DC) students, both Japanese and foreign nationals. If place are available they may be given to master course students.

Grading   Report, class activity, presentation

Course Goals   This course is the pre-course for Engineering Project Management II which will be held in the second semester. Students will learn project management tools, apply project strategies and perform qualitative risk analyses. Also students will learn how to carry out projects with group members from various countries and engineering fields.

Course Topics

Theme	Class number of times	Description
Introduction to the course	1	4/8 The introduction to the course and preliminary knowledge about the engineering project management will be given. (All)
Project Management	1	4/15 I (Lintuluoto)
Project Management	1	4/22 II (Lintuluoto)
Management of abroad dispatched project	1	5/6 Through an abroad dispatched project of Graduate School of Engineering, Kyoto University, the development and management of the project in University will be given. (Mizuno)
TBA	1	5/13
Leadership Skills	1	5/20 I (Tanaka)
Leadership Skills	1	5/27 II (Tanaka)
Risk Identification and Assessment for Engineers	1	6/3 I (Nishi)
Risk Identification and Assessment for Engineers	1	6/10 II Products failure potentially causes serious economic and human damages. This lecture firstly overviews some mechanisms of failure, and introduces actual examples of failure accidents and their costs. And then, damage-tolerance-design methodology in which remaining life and inspection intervals are quantified through fracture mechanics analyses is explained.(Matsumoto)
Design and design thinking	1	6/17 I (Takatori)
Design and design thinking	1	6/24 II (Takatori)
Special Lecture from Industry	1	7/1
Special Lecture from Industry	1	7/8
Special Lecture from Industry	1	7/15
Review of the course	1	7/22 Review of the course

Textbook   Course materials will be provided.

Textbook(supplemental)

Prerequisite(s) ‘ -This course is recommended for those who later intend to attend " Engineering Project Management II ".

-Highly interactive lessons (discussion), Small group work methodologies.

Independent Study Outside of Class

Web Sites   The web-site will be opened in the home page of the GL education center.

Additional Information   Students are requested to check in advance whether the credit from this course will be accepted as a graduation requirement for their department. The course starts on Apr. 10th.

Engineering Project Management　　English lecture

Code　10i048　　Course Year　Doctor Course　　Term　2nd term　　Class day & Period　Fri 5th

Location　B-Cluster 2F Seminar Room　　Credits　1　　Restriction　Student number will be limited.

Lecture Form(s)　Seminar　　Language　English

Instructor　GL center: J.Assoc.Prof. Takatori, Mizuno, Tanaka, Matumoto, Ashida,

Assoc.Prof. Lintuluoto

Course Description　In this course, students will apply the engineering know-how and the skills of management, group leadership, and international communication which they learned in the course of "Engineering Project Management I" to build and carry out a virtual inter-engineering project. This course provides a forum where students' team-plan based on ideas and theories, decision making, and leadership should produce realistic engineering project outcomes. The course consists of intensive group work, presentations, and a few intermediate discussions. A written report will be required.

Grading　Report, class activity, presentation

Course Goals　This course prepares engineering students to work with other engineers within a large international engineering project. In particular this course will focus on leadership and management of projects along with applied engineering skills where the students learn various compromises, co-operation, responsibility, and ethics.

Course Topics

Theme	Class number of times	Description
Guidance	1	Introduction to Engineering Project Management　Lecture on tools for the Engineering Project Management　Practice
Practice I	2	Each student practices the tools for the Engineering Project Management
Group work I	2	Each project team may freely schedule the group works within given time frame. In addition to "Intermediate discussion" sessions, the course instructors are available if any such need is required.
Presentation I & Intermediate discussion I	1	Each project team has a presentation
Group work II	2	
Intermediate discussion II	1	
Group work III	2	
Presentation II	1	
Final discussion	1	

Textbook　Course materials will be provided.

Textbook(supplemental)　Will be informed if necessary.

Prerequisite(s)　Fundamental skills about group leading and communication, scientific presentation.

Independent Study Outside of Class

Web Sites　The web-site will be opened in the home page of the GL education center.

Additional Information　Students are requested to check in advance whether the credit from this course will be accepted as a graduation requirement for their department.

Internship

Code 10i009   Course Year Master and Doctor Course   Term   Class day & Period   Location   Credits

Restriction   Lecture Form(s)   Seminar and Exercise   Language   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Instrumental Analysis, Adv.

Code   10D043   Course Year   Master and Doctor Course   Term   1st term   Class day & Period

Location   A2-307   Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10D046

Instrumental Analysis, Adv.

Code   10D046   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period

Location   A2-307   Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to Biomedical Engineering

Code 10W603   Course Year Master and Doctor Course   Term 1st term   Class day & Period   Location

Credits 2   Restriction No Restriction   Lecture Form(s) Intensive Lecture   Language Japanese

Instructor   ,,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C070

Introduction to Quantum Science

Code   10C070   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	9	
	2	
	3	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10D636

Polymer Design for Biomedical and Pharmaceutical Applications

Code   10D636   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 2nd

Location   A2-307   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to the Design and Implementation of Micro-Systems

Code   10V201   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 5th

Location   C3-Lecture room 1 or 3   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture and Pactice   Language   English

Instructor   O. Tabata, H. Kotera, T. Tsuchiya, R. Yokokawa,

Course Description   This is a joint lecture with Hong Kong University of Science and Technology (HKUST). A team consists of two students from each University work together to fullfill the assignment (design a microsystem) through paper survey, analysis, design, and presentation. A student can acquire not only the basic knowledge of a microsystem, but also comprehensive ability of English such as technical knowledge in English, skill for team work, and communication.

Grading   Presentation, Assignments, and Achievement

Course Goals   Acquire the knowledge and skill to design and analyze a microsystem.

Course Topics

Theme	Class number of times	Description
Tutorial on microsystem CAD software	3	Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.
Lecture and Task Introduction	2	Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechical Systems) utilizing microfabrication technology.
Design and analysis work	3	Analyze and design a microsystem by communicating with a team member of HKUST.
Presentation I	2	The designed device and its analyzed results is presented in detail by team in English.
Evatuation of device	3	Evaluate the fabricated microsystem.
Presentation II	2	The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.

Textbook

Textbook(supplemental)

Prerequisite(s)   Students are required to take the 10G203 course "Micro Process and Material Engineering" provoded in 1st term.

Independent Study Outside of Class

Web Sites

Additional Information   The student of this class is required to register to the course 10G205 "Microsystem Engineering" provided at Friday 4th so as to be able to take consecutive classes at Friday 4th and 5th. Those who want to take this course have to take training course for CAD in advance. Those students who want to take this course has to contact Prof. Tabata (tabata@me.kyoto-u.ac.jp) by the end of 1st term.

Radiation Measurement for Medicine

Code 10W620 Course Year Master and Doctor Course Term 2nd term Class day & Period Fri 2nd

Location C3-Lecture Room 5 Credits 2 Restriction No Restriction Lecture Form(s) Lecture

Language Japanese Instructor Hidetsugu Tsuchida, Yoshinori Sakurai,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Fundamentals for Physical Effects of Radiation Interactions	2	
Fundamentals for Chemical Effects of Radiation Interactions	1	
Fundamental Quantities and Units for Radiation	2	
Radiation Measurements in Medical Physics	3	
Radiation Dosimetry	2	
Estimation for Dose Distribution	2	
Techniques for Radiation Control and Measurement in Medical Radiation Field	1	
Laws and Ordinances for Radiation Therapy	1	
Check of Study Achievement	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to Advanced Nuclear Engineering

Code   10C072   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Micro Process and Material Engineering

Code   10G203   Course Year   Master Course   Term   1st term   Class day & Period   Mon 4th

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   H. Kotera,O. Tabata,K. Eriguchi,I. Kanno,T. Tsuchiya,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Semiconductor microfabrication	3	
Thin-film process and evaluation	3	
Silicon micromachining	3	
3D lithography	3	
Soft-micromachining	2	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10G209

Multi physics Numerical Analysis

Code   10G209   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 1st

Location   C3-Lecture Room 3   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	2	
	2	
	5	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Finite Element Methods

Code   10G041   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture and Practice

Language   English   Instructor   Kotera and Nishiwaki,

Course Description   This course presents the basic concept and mathematical theory of the Finite Element Method (FEM), and explains how the FEM is applied in engineering problems. We also address important topics such as the physical meaning of geometrical non-linearity, material non-linearity, and non-linearity of boundary conditions, and we explore numerical methods to deal with these nonlinearities. Also, we guide students in class in the use of software to solve several numerical problems, to develop practical skill in applying the FEM to engineering problems.

Grading   Grading is based the quality of two or three reports and the final exam.

Course Goals   The course goals are for students to understand the mathematical theory of the FEM and the numerical methods for analyzing non-linear problems based on the FEM.

Course Topics

Theme	Class number of times	Description
Basic knowledge of the FEM	3	What is the FEM? The history of the FEM, classifications of partial differential equations, linear problems and non-linear problems, mathematical descriptions of structural problems (stress and strain, strong form and weak form, the principle of energy).
Mathematical background of the FEM	2	Variational calculus and the norm space, the convergence of the solutions.
FEM formulations	3	FEM approximations for linear problems, formulations of iso-parametric elements, numerical instability problems such as shear locking, formulations of reduced integration elements, non-conforming elements, the mixed approach, and assumed-stress elements.
Classifications of nonlinearities and their formulations	4	Classifications of nonlinearities and numerical methods to deal with these nonlinearities.
Numerical practice	2	Numerical practice using COMSOL.
Evaluation of student achievements	1	

Textbook

Textbook(supplemental)   Bath, K.-J., Finite Element Procedures, Prentice Hall

Belytschko, T., Liu, W. K., and Moran, B.., Nonlinear Finite Elements for Continua and Structures, Wiley

Prerequisite(s)   Solid Mechanics

Independent Study Outside of Class

Web Sites

Additional Information

Microsystem Engineering

Code   10G205   Course Year   Master Course   Term   2nd term   Class day & Period   Fri 4th   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   O. Tabata,H. Kotera,T. Tsuchiya,R. Yokokawa,

Course Description   Microsystem covers not only technologies related to individual physical or chemical phenomenon in micro scale, but also complex phenomena which are eveolved from their interaction. In this course, the physics and chemistry in micro and nanoscale will be lectured in contrast to those in macro scale. The various kinds of application devices (ex. physical (pressure, flow, force) sensors, chemical sensors, biosensors, actuators (piezoelectric, electrostatic, and shape memory) and their system are discussed.

Grading   The evaluation will be based on the reports given in each lecture.

Course Goals   Understand the theory of sensing and actuating in microsystem. Acquire basic knowledge to handle various kinds of phenomena in microscale.

Course Topics

Theme	Class number of times	Description
MEMS modeling	2	Multi-physics modeling in microscale. Electro-mechanical coupling analysis.
MEMS simulation	2	System level simulation in MEMS.
Electrostatic microsystem	3	Electrostatic sensors and actuators. Theory and application devices.
Physical sensors	4	Physical sensors as a fundamental application in microsystem. Accelerometer, vibrating gyroscope, pressure sensors.
Micro total analysys system	4	Chemical analysis system and bio-sensing device using microsytem.

Textbook   Provided in the lecture.

Textbook(supplemental)   Provided in the lecture.

Prerequisite(s)   Students are required to take the 10G203 course "Micro Process and Material Engineering".

Independent Study Outside of Class

Web Sites

Additional Information   The student can register only to this class 10G205, but it is required to be able to take consecutive classes at Friday 4th and 5th. Those students who want to take this course has to contact Prof. Tabata (tabata@me.kyoto-u.ac.jp) by the end of 1st term. The student of this class is strongly recommended to take a course 10V201 "Introduction to the Design and Implementation of Micro-Systems"(10V201), which is a practice for designing microsystem. Those who want to take 10V201 have to take training course for CAD in advance.

Quantum Science

Code   10C074   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 1st

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description   This course involves fundamental interactions of electrons, ions and photons to atoms, molecules and condensed matters, and practical applications for nanotechnology. Great emphases are on fundamental mechanisms of beam-solid interactions, characterization techniques, material synthesis and processing for quantum devices with quantum beam. Recent progress of related area of quantum beam will be also introduced in this course.

Grading   Coursework will be evaluated with attendance and report on subjects.

Course Goals   To provide students to understand fundamental interactions in quantum science.

Course Topics

Theme	Class number of times	Description
Interactions between quantum beams and solids	7	Interactions between quantum beams and solids are described with various formulas. Collisions with nucleus, electronic excitation, defect formation and energy loss will be discussed and related scientific topics, such as discovery of electron will be introduced.
Applications of quantum beams	7	The interactions of quantum beam are widely used for various applications. Material processing and analysis with quantum beams are essential in nanotechnology and quantum beams are also important for diagnostics of diseases and cancer therapy in medical field. Practical applications will be presented with recent progress and challenges.
Final examination and report	1	Evaluation will be given by the contents of the reports and quizzes of the subjects leaned in this course.

Textbook   Ion-Solid Interactions: Fundamentals and Applications (Cambridge Solid State Science Series) M. Nastasi, J. Mayer, J. Hirvonen

Textbook(supplemental)

Prerequisite(s)   Solid state physics, Quantum mechanics(beginner's), Electromagnetism

Independent Study Outside of Class

Web Sites

Additional Information

10C017

Radiation Physics and Engineering

Code   10C017   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 3rd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	5	
	2	
	2	
	2	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Radiation Medical Physics

Code   10C047   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 3rd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Yoshinori Sakurai,Takushi Takata

Course Description   Medical physics is the general term for the physics and technology which are supporting radiation diagnosis and therapy, and particle therapy. As it covers many different fields, the important subjects are "promotion for the advance of radiation therapy" and "quality assurance for radiation therapy". The scope of this course is to learn the fundamental knowledge for radiation medical physics. Especially, the focus is put on the understanding for (1) the bases of physics, biology and so on for radiation, (2) the physics for the radiations applied to diagnosis, (3) the characteristics of radiations and particle beams applied to therapy, and (4) the quality assurance and so on for radiation diagnosis and therapy.

Grading   Attendance and reports

Course Goals   To learn the fundamental knowledge of medical physics, mainly for radiation physics in diagnosis and therapy

Course Topics

Theme	Class number of times	Description
Introduction to medical physics for radiation	1	
Fundamental bilology for radiation	1	
Radiation measurement and evaluation	2	
Physics in radiation diagnosis	4	
Physics in radiation therapy	5	
Quality assurance and standard dosimetry	1	
Achievement Assessment	1	

Textbook   Not specified. Handouts will be given for each topic.

Textbook(supplemental)   F.M.Khan, "The Physics of Radiation Therapy: Mechanisms, Diagnosis, and Management" (Lippincott Williams & Wilkins, Baltimore, 2003)

Prerequisite(s)   It is recommended to attend the course, "Radiation Measurement for Medicine", concurrently.

Independent Study Outside of Class

Web Sites

Additional Information

Radiation Biology and Medicine

Code   10C046   Course Year   Master Course   Term   1st term   Class day & Period   Mon 2nd   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Relay Lecture   Language   Japanese

Instructor   ,,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	4	
	4	
	5	
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Hybrid Advanced Accelerator Engineering

Code　10C078　　Course Year　Master and Doctor Course　　Term　1st term　　Class day & Period　Wed 3rd

Location　C3-Lecture Room 5　　Credits　2　　Restriction　No Restriction　　Lecture Form(s)　Lecture

Language　Japanese　　Instructor　Yoshiharu Mori,

Course Description　Particle accelerator is essential for proceeding nuclear and particle physics but also becomes a very important tool for future nuclear sciences and engineering. In this lecture, a basics theory of accelerator physics including beam optics and dynamics of the circular accelerators is given, and also various applications of the accelerators are also presented.

Grading　Reports on practical issues and subjects.

Course Goals　This lecture aims to learn a basic accelerator theory and to attain abilities to make a primitive design of circular accelerator.

Course Topics

Theme	Class number of times	Description
Hisitory and outline of particle accelerator	1	
Basic theory of beam dynamics in circular accelerator	2	
Beam oribit theory	3	
Hardwares of particle accelerator	2	
Strong focusing theory and lattice design	3	
Radio frequency acceleration theory	3	
Summary and check the accomplishment	1	

Textbook

Textbook(supplemental)　J.J.Livingood, Cyclic Particle Accelerator, Van Nostland, New York (1961).E.D. Courant and H.S.Snyder, Ann. Physics, 3,1(1958).

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Diagnostic Imaging

Code 10W606   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits 2   Restriction No Restriction   Lecture Form(s) Intensive Lecture   Language Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Radiation Treatment Planning,Radiation Treatment Metrology,Practice

Code   10W618   Course Year Master and Doctor Course   Term 1st term   Class day & Period   Location

Credits   2   Restriction   No Restriction   Lecture Form(s) Intensive Lecture   Language   Japanese

Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C068

Nuclear Engineering Application Experiments

Code   10C068   Course Year   Master and Doctor Course   Term   1st+2nd term   Class day & Period

Location   Research Reactor Institute   Credits   2   Restriction   No Restriction   Lecture Form(s)   Exercise

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Nuclear Engineering, Adv.

Code   10C084   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 4th

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	11	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H649

Polymer Synthesis

Code   10H649   Course Year   Master Course   Term   1st term   Class day & Period   Wed 2nd

Location   A2-306   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Physical Properties

Code　10D651　　Course Year　Master Course　　Term　1st term　　Class day & Period　Thu 2nd

Location　A2-307　Credits　2　Restriction　No Restriction　Lecture Form(s)　Lecture　Language　Japanese

Instructor　Hirokazu Hasegawa, Takenao Yoshizaki, Tsuyoshi Koga, Mikihito Takenaka, Hiroyuki Aoki,

Course Description　A concise explanation is given of physical properties of polymer solutions and polymeric solids along with relevant basic theories.

Grading　Final grades will be evaluated in a comprehensive manner on the basis of attendance, reports, and examinations.

Course Goals　Fundamental knowledge of physical properties of polymer materials.

Course Topics

Theme	Class number of times	Description
Polymer Chain Conformation in Dilute Solutions	3	After a clarification of basic factors which determine the conformations of real polymer chains in dilute solutions, some polymer chain models are introduced to describe the equilibrium conformational behavior of the real chains. Further, behavior of average chain dimensions as a functions of molecular weight is considered based on the chain models.
Thermodynamics and Phase Behavior of Polymer Solutions	3	Various phase transition phenomena in polymer solutions (phase separation, hydration, association, gelation, etc.) are systematically explained from thermodynamic and statistical-mechanical viewpoints. "Phase separation of polymer solutions", "Aqueous polymer solutions", and "Association and gelation of polymers" are discussed in the lectures.
Exercise	1	Exercise in polymer solutions.
Structure and Mechanical Properties of Polymeric Solids	4	Polymeric solids such as rubber and plastics, especially thermodynamics of rubber elasticity, polymer crystallization and crystalline/amorphous higher-order structures, are discussed. Moreover, fundamentals of viscoelastic properties of polymers are introduced to provide the understandings of relaxation phenomena such as glass transition.
Electronic and Optical Properties of Polymeric Solids	3	The electronic and optical properties of polymers is reviewed. The application of polymer materials in the opto-electronics and display devices is also presented.
Exercise	1	Exercise in polymeric solids.

Textbook　Lecture notes distributed in the class.

Textbook(supplemental)

Prerequisite(s)　Fundamental knowledge of physical chemistry.

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Functional Chemistry

Code   10H645   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 2nd

Location   A2-307   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design of Polymerization Reactions

Code   10H607   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 3rd

Location   A2-302   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Mitsuo Sawamoto and Makoto Ouchi,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	2	
	2	
	2	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Reactive Polymers

Code   10H610   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   A2-307   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Structure and Function

Code 10H613 Course Year Master Course Term 2nd term Class day & Period Thu 2nd

Location A2-307 Credits Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor H. Ohkita

Course Description In this class, optoelectronic functions of polymeric materials are discussed on the basis of photochemistry and photophysics. In particular, the importance of designing nanostructures of polymer assembly is highlighted by explaining examples of state-of-the-art applications, which include optical fibers, organic light-emitting diode, and organic solar cells.

Grading Evaluated with the grade on the final test or the quality of report submitted after the final class.

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction	1	
Conductive Polymers	3	
Photofunctional Polymers	3	
Optoelectronic Polymers	4	

Textbook None: Some handouts will be dealt in the class of every lecture.

Textbook(supplemental) None:

Prerequisite(s) Students are expected to have knowledge of Physical Chemistry and Polymer Chemistry provided in chemisty course for undergraduate.

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Supermolecular Structure

Code   10H616   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Location

Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hirokazu Hasegawa, Mikihito Takenaka,

Course Description   Polymers self-assemble or self-organize by intra- and/or intermolecular interaction to form assembled structures of polymer molecules. Such structures are closely related to the properties of the polymeric materials, it is necessary to control the assembled structures of the constituent polymer molecules in order to control the properties of polymeric materials, especially solid materials. In this lecture particularly, formation mechanisms, analytical techniques, and elucidated structures of crystalline polymers, phase-separated structures of polymer mixtures, microphase-separated structures of block and graft copolymers will be discussed.

Grading   The grading is based on the short tests and report assignments.

Course Goals   This course aims for the development of the faculty to infer the properties of polymeric materials from their morphology based on the knowledge of structure-property relationships of higher-order structures of crystalline polymers, phase-separated structures of polymer mixtures (blends), microdomain stuctures of block copolymers, etc.

Course Topics

Theme	Class number of times	Description
Self-assembly and Self-organization	1	The differences between self-assembly and self-organization will be discussed by referring the examples in natural phenomena and polymeric systems.
Crystalline Polymers	3	In the lectures, unit cell structures and hierarchical higher-order structures of polymer crystals such as folded-chain lamellar crystals and spherulites, as well as deformation and thermal behavior of polymer crystals will be discussed.
Polymer Blends	3	Miscibility, phase-diagrams, mechanisms and dynamics of phase transitions, relationships between phase-separated structures and properties, methods to control the phase-separated structures will be discussed.
Block and Graft Copolymers	3	The lectures include nano-scale domain formation of block copolymers by microphase-separation, miscibility and phase diagrams, order-disorder and order-order transitions, bicontinuous structures, structure formation in thin films, blends with homopolymers or other block copolymers, multi-component multi-block copolymers, miktoarm star block copolymers, and more.
Evaluation of Degree of Understandings	1	Degree of understandings of the lectures will be evaluated by means of a short test and group discussions.

Textbook   Not used.

Textbook(supplemental)   Introduced in the lectures.

Prerequisite(s)   Thermodynamics preferable.

Independent Study Outside of Class

Web Sites

Additional Information

Biomacromolecular Science

Code 10H611 Course Year Master and Doctor Course Term 1st term Class day & Period Tue 2nd

Location A1-001 Credits Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Solution Science

Code   10H643   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   A2-307   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Takenao Yoshizaki, Yo Nakamura,

Course Description   Effects of stiffness and local conformations of polymer chains on polymer solution properties observed in the light scattering and viscosity experiments are considered based on appropriate polymer chain models.

Grading   Term-end examination.

Course Goals

Course Topics

Theme	Class number of times	Description
Review	1	Definitions of physical quantities determined from the light scattering and viscosity measurements and the theoretical formulations of those quantities.
Experiments in dilute polymer solutions	2	Principles of the light scattering and viscosity experiments.
Polymer chain models and their statistics	2	Static models for polymer chains: the Gaussian chain, the wormlike chain, and the helical wormlike chain. A comparison of experimental data for the mean-square radius of gyration with relevant theories.
Excluded-volume effects	2	Intra- and intermolecular excluded-volume effects represented by the expansion factors and the second virial coefficient, respectively.
Steady-state transport properties	2	A comparison of experimental data for the intrinsic viscosity and diffusion coefficient with relevant theories.
Dynamic properties	2	Dynamic models for polymer chains: the Rouse-Zimm spring-bead model and the dynamic helical wormlike chain. A comparison of experimental data for the first cumulant of the dynamic structure factor with relevant theories.

Textbook   Lecture note distributed in the class.

Textbook(supplemental)

Prerequisite(s)   Basic knowledge of polymer solutions given in the lecture "Polymer Physical Properties (10 D651)."

Independent Study Outside of Class

Web Sites

Additional Information

Physical Chemistry of Polymers

Code   10H622   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   A2-307   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   lecture   Language   Japanese

Instructor   Tsuyoshi Koga

Course Description   Molecular mechanism of characteristic physical properties of polymeric systems is lectured on the basis of the equilibrium and non-equilibrium statistical mechanics. Main topics are phase separation of polymer solutions and mixtures, microphase separation of block copolymers, gelation, rubber elasticity, and rheology of physical gels.

Grading

Course Goals   Understanding the molecular mechanism of characteristic physical properties of polymeric systems based on the equilibrium and non-equilibrium statistical mechanics.

Course Topics

Theme	Class number of times	Description
phase separation of polymer solutions and mixtures	2	phase diagram, Flory-Huggins theory, mean-field theory, phase separation, spinodal decomposition
microphase separation of block copolymers	1	microphase separation, density functional theory, directed self-assembly
gelation	1	definition of gels, classification of gels, classical theory of gels, sol-gel transition, elastically effective chains
rubber elasticity	3	affine network theory, phantom network theory, tetra-PEG gel, slide-ring gel
rheology of associating polymers	3	telechelic associating polymers, linear viscoelasticity, Maxwell model, shear thickening, transient network theory, colloid/polymer mixture, shear-induced gel
verification of understanding	1	

Textbook

Textbook(supplemental)   P.J. Flory, "Principles of Polymer Chemistry" (Cornell Univ. Press, New York, 1955) M. Rubinstein, R.H. Colby, "Polymer Physics" (Oxford Univ. Press, New York, 2003)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Spectroscopy

Code   10H625   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 3rd

Location   ICR Seminar Room   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   K. Nishida

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Outline of Polymer Spectroscopy	2	
Basic Mathematics for Spectroscopy	2	
Neutron Spectroscopy	2	
Infrared, Raman, Brillouin Spectroscopy	3	
Photon Correlation Spectroscopy	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design of Polymer Materials

Code   10H628   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 2nd

Location   (Uji campus) ICR Seminar Room   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Yoshinobu TSUJII, Kohji OHNO

Course Description   This course aims at better understanding of fundamentals on living radical polymerization and describes its application to graft polymerization for novel surface modification as well as its related matters.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction to radical polymerization	1	radical polymerization, mechanism, kinetics, elementary reaction
Fundamentals on living radical polymerization and its application to material design	2	living radical polymerization, mechanism, kinetics, functional polymer, material design
Physical chemistry on surfaces and polymer brushes	2	Surface, interface, physical chemistry, polymer brush, theory, structure, property
Living radical polymerization and polymer particles	2	Living radical polymerization, surface-initiated polymerization, polymer brush, hairy particle, star polymer
Synthesis of polymer particles by radical polymerizations	2	Emulsion polymerization, suspension polymerization, dispersion polymerization, precipitation polymerization, self-organized precipitation, nonspherical particle
Applications of polymer particles	2	Self-assembly, dispersion and aggregation, depletion force, pickering emulsion, composites, biochemical and biomedical applications

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H647

Polymer Controlled Synthesis

Code   10H647   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 4th

Location   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biomaterials Science and Engineering

Code   10H633   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   A2-307   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H029

Polymer Physics and Function

Code 10H029   Course Year Master Course   Term (not held; biennially)   Class day & Period   Location

Credits   Restriction   Lecture Form(s)   Language Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Engineering for Chemical Materials Processing

Code   10H021   Course Year   Master and Doctor Course   Term   Spring   Class day & Period   Wed 4th   Location   A2-302

Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Dept. of Chemical Engineering, Prof. M.Ohshima

,Dept of Chemical Engineering, Associate Prof. S.Nagamine,

Course Description   Focusing on transport phenomena (flow & rheology, mass flux, heat flux) in polymer processing process, the key relationships among polymer properties, processing schemes, and processing machine are taught.

Grading   40% midterm quiz, 60% exam at end

Course Goals   The objective of this course is to know how the polymers are different in terms of thermal, rheological and mechanical properties. The attendees learn what Tg, Tc, Tm, G' and G'' are, how those properties can be measured and how these obtained measurement data can be appreciated. Visual Observation movies relates those properties with the transport phenomena that occur in several polymer processing processes.

Course Topics

Theme	Class number of times	Description
Orientation & Introduction of Polymer Processing		The characteristics of polymers are reviewed by exercising the characterization of general polymers, like PE, PP, PLA, PC, PS, PVC in terms of appearance, thermal and mechanical properties.
State of Thermoplastic Polymer	1	The relationship among pressure-volume-temperature of thermoplastic polymer is described. The way of identifying the Tg, Tc is taught. Several equations of state are introduced.
Thermal Properties of Thermoplastic Polymers	2	Several important thermal properties of thermoplastic polymers, such as glass transition temp, Tg, crystallization temp, Tc, and melting temp, Tm are explained together with the measurement methods of those thermal properties. The latest measurement device, Flash DSC, is introduced with some of the interesting data of crystallization process.
Rheological Properties of Thermoplastic Polymers	2	The basic of polymer rheology, viscosity and elasticity, is given. Several phenomena of non-Newtonian fluid are introduced. The fundamental constitutive equations, Maxwell and Voigt models, describing the viscoelasticity of the polymers are explained. Exercising on identification of polymer structures, such as the degree of entanglement, molecular weight, presence of long-chain branch from the rheological data, relationship between polymer rheology and polymer structure is explained.
Basic Flows in Polymer Processing		The basics of Polymer Processing are the series of Melt, Flow and Shape. Here the class focus on the Flow. The two types flow, i.e., drag and pressure flows are explained together with master equation. Without solving the mathematical equations, the skill of estimating the velocity profile is cultivated.
Visual Observation of Flow Phenomena in Processing Machine		Entertaining several visual observation movies showing the flow phenomena in real polymer processing machine like injection molding machine and extruder, The effects of thermal and rheological properties of polymer on those flow phenomena are clarified.
Phase separation and Morphology Formation	2	The basic of phase separation of polymer-polymer, polymer-solvent are taught.
Phase Separation Phenomena in Polymer Processing		Several polymer processing schemes exploiting a phase separation phenomenon are introduced. Synergistic design of the polymer properties, processing scheme and processing machine is stressed.
Check what we learn	1	During the class, plenty of quiz are given to check the understanding.

Textbook   Handout

Textbook(supplemental)   Agassant, J.F., Polymer Processing: Principles and Modeling

Prerequisite(s)   Basic of Transport Phenomena

Independent Study Outside of Class

Web Sites

Additional Information

10H017

Fine Particle Technology, Adv.

Code   10H017   Course Year   Master and Doctor Course   Term   Autumn   Class day & Period   Mon 2nd

Location   A2-302   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Dept. of Chem. Eng., Professor, Shuji Matsusaka

Course Description   Analyses of particle behavior in gases, Particle handling operations, and measurement methods are lectured. Also, particle charging that affect particle behavior in gases are theoretically explained. Furthermore, the control of the particle charging and its applications are lectured.

Grading   Examination

Course Goals   Understand the analysis and modeling of dynamic behavior of particles. Furthermore develop the ability to apply the knowledge for particle handling and processing.

Course Topics

Theme	Class number of times	Description
Particle properties and measurements	3	Mathematical description of particle diameter distribution, properties of fine particles, and their measurement methods are explained.
Particle adhesion and dynamical analysis	3	Measurement methods for adhesion forces of particles and dynamical analysis method for particle collision and elastic deformation are lectured. Furthermore, distinct element method is explained.
Behavior of particles in airflow	3	Temporal and spatial distribution of deposition and reentrainment of fine particles in gas-solid flow are explained using physical models and probability theory. In addition, complicated reentrainment phenomena during particle collision are discussed.
Particle charging and control	2	Concept of particle charging and quantitative analysis methods of charging process are explained; also, charge distribution of particles is analyzed. Furthermore, new methods to control particle charge are introduced.

Textbook   Lecture notes

Textbook(supplemental)   K. Okuyama, H. Masuda and S. Morooka: Biryuushi Kougaku − Fine particle technology, Ohmsha, Tokyo (1992)

Prerequisite(s)   Basic knowledge on powder technology in bachelor course

Independent Study Outside of Class

Web Sites

Additional Information

Surface Control Engineering

Code   10H020   Course Year   Master and Doctor Course   Term   Class day & Period   Wed 2nd

Location   A2-305   Credits   Restriction   No Restriction   Lecture Form(s)   Language   Japanese

Instructor   M.Miyahara,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	2	
	3	
	2	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C208

Thermodynamics for Materials Science, Adv.

Code   10C208   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   Engineering Science Depts Bldg.-112   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Chemistry of Polymer Materials

Code 10H007 Course Year Master Course Term Class day & Period Fri 2nd Location A2-302

Credits Restriction Lecture Form(s) Lecture Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	2	
	6	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Chemistry of Biomaterials

Code 10H031   Course Year Master Course   Term   Class day & Period Tue 2nd   Location A2-302

Credits   Restriction   Lecture Form(s)   Language Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	12	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Biology

Code 10H812   Course Year Master and Doctor Course   Term 1st term   Class day & Period Thu 2nd

Location A2-308   Credits   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   ,,

Course Description   Biological responses are elicited at the interface of intrinsic genetic information and extrinsic environmental factors. This course discusses on molecular aspects of brain function and immunity. Experimental tools such as fluorescent probes for second messenger molecules are also explained through performance of experiments using the probes.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Basics	1	
Principles of neurotransmission	3	
Immunity and inflammation	2	
Gaseous bioactive molecules	2	
Experiments to observe cellular responses	3	

Textbook   Provided in the course

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H815

Biorecognics

Code   10H815   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 2nd

Location   A2-308   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Bioorganic Chemistry

Code 10H813 Course Year Master and Doctor Course Term 2nd term Class day & Period Thu 2nd

Location A2-308 Credits Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Microbiology and Biotechnology

Code   10H816   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   A2-308   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Haruyuki Atomi, Tamotsu Kanai

Course Description   This lecture will introduce the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. Commonly used tools in the fields of biochemistry, molecular biology and genetics will also be discussed. In addition, methods to utilize cells and their enzymes in biotechnology will be introduced. Lectures will be given in English, with the aim to improve communication/discussion skills.

Grading   Grading will be based on presentations (60%) and attendance (40%).

Course Goals   Basic knowledge on the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. An understanding of the commonly used tools in the fields of biochemistry, molecular biology and genetics as well as methods to utilize cells and their enzymes in biotechnology. Lectures will be given in English, with the aim to improve communication/discussion skills.

Course Topics

Theme	Class number of times	Description
Introduction	1	Diversity of life, classification of organisms, structure and function of fundamental biomolecules.
Basic mechanisms to sustain life	3	Strategies to conserve energy, biosynthesis, cell division, cell differentiation.
Strategies to adapt to environmental conditions	2	Effect of environmental conditions on cells and biomolecules, thermophiles, acidophiles and their enzymes.
Protein engineering	2	Methods to study enzymes and enzyme reactions, methods to enhance their performance.
Cell engineering	2	Methods utilized in metabolic engineering, cell surface engineering, synthetic biology.
Topic discussion	1	Particular topics will be chosen for discussion

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Physical Organic Chemistry

Code   10H808   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   A2-308   Credits   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Kenji Matsuda

Course Description   Properties of organic compounds, such as electric conductivity, magnetism, photophysical properties, are discussed in terms of molecular structure and electronic structure

Grading   Report

Course Goals   To understand principles of photochemistry

Course Topics

Theme	Class number of times	Description
Photochemical Reaction	1	Photochemistry, Photophysics, einstein (unit), Jablonski diagram, Excitation, Internal conversion, Intersystem crossing, Fluorescence, Phosphorescence, Photochemical reaction
Excited States in Molecular Orbital Theory	2	Born-Oppenheimer approximation, Flanck-Condon principle, Singlet, Triplet, Energy gap, n-pi*, pi-pi*, Potential energy surface, Conical intersection, Solvatochromism
Electronic Transition	2	Transition probability, Fermi's golden rule, Transition moment, Oscillator strength, Polarized light, Stimulated emission, Einstein coefficient, Beer-Lambert law, Selection rule, Spin-orbit coupling
Radiative Transition	2	Fluorescence, Phosphorescence, Fluorescence excitation spectrum, Mirror relationship, Vibrational structure, Fluorescence quantum yield, Emission rate constant
Behavior of	2	Energy Transfer, Quenching, Trivial, Foerster, Dexter, FRET, Stern-Volmer plot, Excimer, Exciplex, Triplet sensitization
Phororeaction, Photoisomerization	2	Quantum yield, Photochromism, Conversion in photoisomerization

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H818

Advanced Organic Chemistry

Code   10H818   Course Year   Master Course   Term   1st term   Class day & Period   Tue 1st

Location   A2-306   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Professor Jun-ichi Yoshida and other professors

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Chemoselectivity	2	Introduction and chemoselectivity
Regioselectivity	2	Controlled Aldol Reactions
Stereoselectivity	2	Stereoselective Aldol Rections
Strategies	2	Alternative Strategies for Enone Synthesis
Choosing a Strategy	2	The Synthesis of Cyclopentenones
Summary	1	Summary and outlook

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Organic Chemistry 2 Continued

Code   10P818   Course Year   Master 1st   Term   1st term   Class day & Period   Tue 1st

Location   A2-306   Credits   Restriction   No Restriction   Lecture Form(s)   Seminar   Language   Japanese

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	5	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H836

Advanced Biological Chemistry

Code   10H836   Course Year   Master Course   Term   1st term   Class day & Period   Location   A2-308

Credits   3   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Biological Chemistry 2 Continued

Code   10P836   Course Year   Master Course   Term   Class day & Period   Location   Credits   1

Restriction   Lecture Form(s)   Intensive Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H448

Biomolecular Function Chemistry

Code   10H448   Course Year   Master and Doctor Course   Term   (not held; biennially)

Class day & Period   Mon 2nd   Location   A2-304   Credits   1.5   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   Shirakawa, Sugase

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	2	
	3	
	2	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Frontiers in the Field of Chemical Biology and Biological Chemistry

Code 10H409   Course Year Master and Doctor Course   Term 2nd term   Class day & Period Tue 5th

Location A2-302   Credits   Restriction No Restriction   Lecture Form(s) Relay Lecture

Language English   Instructor K. Akiyoshi,M.Shirakawa,Y.Tabata,I.Hamachi,Y.Mori,M.Umeda,H.Atomi,

Course Description   In the cutting-edge of reseach fields, chemistry and biologi are being closely related each other. In this class,progress in such interdisciplinary areas and topics including natural products, biophysics, bioimaging , baimaterials, regenerative medicine, microbiology, thermal biology, strucural biology, chemical biology, molecular physiology and others, are briefly explained and discussed.

Grading   Evaluation will be conducted by attendance and scores for excercises and problems that each lecturer charges in his topics

Course Goals   Students will be able to understand recent progress and trends in broad interdisciplinary areas between biology and chemistry and make their own ideas in these research fields from a viewpoint of indicvidual researchers and engineers.

Course Topics

Theme	Class number of times	Description
10/6-1/12	11	The guidance will be conducted at the first day of this class (Oct. 6th, 2015).

Textbook

Textbook(supplemental)

Prerequisite(s)   Fundamentals in chemistry, biochemistry, biology, and materials science.

Independent Study Outside of Class

Web Sites

Additional Information   The credit for MS2 students will be guided in detail at the first day.

Laboratory of Engineering for Life Science and Medicine

Physiology

Code 10H641   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits 2   Restriction No Restriction   Lecture Form(s) Intensive Lecture   Language Japanese

Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Beam Science, Adv.

Code   10R001   Course Year   Doctor Course   Term   1st term   Class day & Period   Fri 4th

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Neutron Science

Code   10C018   Course Year   Master and Doctor Course   Term   1st term   Class day & Period Fri 1st

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s) Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	6	
	2	
	3	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Manipulation Technology

Code   10C031   Course Year   Master and Doctor Course   Term   1st term   Class day & Period Fri 1st

Location Bldg.No.1-Nuclear Engineering 2   Credits 2   Restriction No Restriction   Lecture Form(s) Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	14	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C082

Applied Neutron Engineering

Code   10C082   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 3rd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Medical Physics

Code 10W652   Course Year Master and Doctor Course   Term 1st term   Class day & Period   Location

Credits 2   Restriction No Restriction   Lecture Form(s) Intensive Lecture   Language Japanese

Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Human Anatomy

Code   10W696   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 3rd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Seminar on Polymer Industry

Code   10H638   Course Year   Master Course   Term   1st term   Class day & Period   Fri 3rd and 4th

Location   A2-306   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10V003

Biomechanics

Code   10V003   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 4th

Location   Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   Taiji Adachi,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biomolecular Dynamics

Code   10D450   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 3rd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Robotics

Code　10B407　Course Year　Master Course　Term　2nd term　Class day & Period　Mon 2nd

Location　C3-Lecture Room 5　Credits　2　Restriction　No Restriction　Lecture Form(s)　Lecture

Language　Japanese　Instructor　Fumitoshi Matsuno,

Course Description　Understanding of intelligent behaviors of living things is very interesting. And realization of their intelligent motion by a robot is also attractive for mechanical engineering. In this lecture, we consider basic understanding of beautiful human skill "manipulation" on the point of view of dynamics and control. First modeling methodologies for a rigid multibody system and a general dynamic model of a manipulator are provided. Next, a typical nonlinear control law is introduced and some problems for applying the controller are shown. Based on nature of the dynamics of the manipulator, a very simple and robust controller can be derived by designing energy of the system. This lecture provides modeling methodologies and controller design strategies of the rigid multibody system and we analyze a beautiful human skill of the manipulation.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Materials

Code   10H413   Course Year   Master and Doctor Course   Term   (not held; biennially)

Class day & Period   Wed 2nd   Location   A2-304   Credits   1.5   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   A. Ito

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	4	
	3	
	4	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H202

Green and Sustainable Chemistry

Code 10H202   Course Year Master and Doctor Course   Term   Class day & Period   Location   Credits

Restriction   No Restriction   Lecture Form(s) Lecture   Language   Japanese

Instructor   K.Ohe,Y.Tsuji,T.Sakka,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Excited-State Hydrocarbon Chemistry

Code 10H207   Course Year Master and Doctor Course   Term   Class day & Period   Location   Credits

Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H002

Special Topics in Transport Phenomena

Code 10H002   Course Year Master and Doctor Course   Term Spring term   Class day & Period   Location

Credits 1.5   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   Department of Chemical Engineering, Professor, Ryoichi Yamamoto

Course Description   After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on " Langevin Equation", " Hydrodynamic Interaction", and " Linear Response Theory" will also be given.

Grading   Answers to several questions and exercises, which will be given during the course, are used to judge.

Course Goals   To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

Course Topics

Theme	Class number of times	Description
- Polymeric Liquids / Rheology	6	Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation	3	To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction	2	To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.
Understanding Check	1	

Textbook   Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

Textbook(supplemental)   Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowlter, (Cambridge)

Prerequisite(s)   Under graduate level basic knowledge on " Fluid Mechanics / Transport Phenomena" and basic mathematics including " Vector Analyses" are required.

Independent Study Outside of Class

Web Sites

Additional Information   This is an biennial course which will be open in 2016, 2018, 2020, ...

Advanced Topics in Transport Phenomena   English lecture

Advanced Topics in Transport Phenomena

Code   10H003   Course Year   Master and Doctor Course   Term   Spring term

Class day & Period   Tue 4th   Location   A2-305   Credits   1.5   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   English

Instructor   Department of Chemical Engineering, Professor, Ryoichi Yamamoto

Course Description   After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on "Langevin Equation", "Hydrodynamic Interaction", and "Linear Response Theory" will also be given.

Grading   Answers to several questions and exercises, which will be given during the course, are used to judge.

Course Goals   To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

Course Topics

Theme	Class number of times	Description
- Polymeric Liquids / Rheology	6	Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation	3	To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction	2	To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.
Understanding Check	1	

Textbook   Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

Textbook(supplemental)   Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowlter, (Cambridge)

Prerequisite(s)   Under graduate level basic knowledge on "Fluid Mechanics / Transport Phenomena" and basic mathematics including "Vector Analyses" are required.

Independent Study Outside of Class

Web Sites

Additional Information

10H008

Chemical Reaction Engineering, Adv.

Code 10H008 Course Year Master and Doctor Course Term Class day & Period Wed 3rd Location A2-305 Credits
Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor Prof. Motoaki Kawase, Department of Chemical Engineering; Assoc. Prof. Hiroyuki Nakagawa, Department of Chemical Engineering

Course Description The following contents are covered:

- Kinetic analysis of gas-solid-catalyst reaction, gas-solid reaction, CVD reaction, and enzymatic reaction,

- Operation and design of reactors for gas-solid-catalyst and gas-solid reactions, and

- Industrial reactors including fixed bed, fluidized bed, moving bed, simulated moving bed, and stirred tank types.

Grading Based on the result of examination at the end of term and the results of quizzes and reports imposed every week

Course Goals To understand kinetic analysis of chemical reactions utilized in the industry and procedure to design and operate industrial reactors.

Course Topics

Theme	Class number of times	Description
Gas-solid-catalyst reaction (1) Overview	1	Commercial catalysts and industrial gas-solid-catalyst reactions are overviewed. Chemical reaction engineering fundamentals of the gas-solid-catalyst reaction is explained.
Gas-solid-catalyst reaction (2) Generalized effectiveness factor and selectivity in complex reactions	1	The generalized effectiveness factor and the selectivity affected by mass transfer are explained.
Gas-solid-catalyst reaction (3) Deactivation and regeneration of catalyst	2	Deactivation mechanisms of solid catalysts are overviewed. The deactivation and consequent change in selectivity are explained in terms of the decay function and specific activity.
Gas-solid-catalyst reaction (4) Design and operation of industrial catalytic reactors	1	Industrial catalytic reactors including fixed-bed and fluidized-bed reactors are overviewed. Design and operation of these reactors including thermal stability are explained.
Liquid-solid-catalyst reaction -- Simulated moving bed reactor	1	Concepts and theories of simulated moving bed is explained. Its application to catalytic reactions are reviewed.
CVD reaction (1) Fundamentals	1	Thermal and plasma chemical vapor deposition reactions and processes are overviewed. Fundamentals from chemical reaction engineering view point are explained.
CVD reaction (2) Kinetic analysis and modeling	1	Kinetic analysis of CVD is described from CRE viewpoint. Reaction models including elementary reaction model and overall reaction model are derived and applied to some examples.
Gas-solid reaction (1) Kinetic analysis	2	Kinetic measurement and analysis of complicated gas-solid reactions, particularly coal pyrolysis, are explained with the first-order reaction model to the distributed activation energy model (DAEM).
Gas-solid reaction (2) Kinetic analysis of gas-solid reaction	1	Concepts and derivation of the reaction models including the grain model and the random-pore model are explained. Application of the models to coal gasification is overviewed.

Textbook Prints are distributed.

Textbook(supplemental)

Prerequisite(s) Needs knowledge of chemical reaction engineering including heterogeneous reactions.

Independent Study Outside of Class

Web Sites

Additional Information

Chemical Reaction Engineering, Adv.   English lecture

Chemical Reaction Engineering, Adv.

Code 10H009   Course Year Master and Doctor Course   Term   Class day & Period Fri 2nd   Location A2-305   Credits

Restriction   Lecture Form(s)   Language English

Instructor   Prof. Motoaki Kawase, Department of Chemical Engineering; Assoc. Prof. Hiroyuki Nakagawa, Department of Chemical Engineering

Course Description   This lecture is given in English. The following contents are covered: - Kinetic analysis of gas-solid-catalyst reaction, gas-solid reaction, and CVD reaction, - Operation and design of reactors for gas-solid-catalyst and gas-solid reactions, and - Industrial reactors including fixed bed, fluidized bed, moving bed, simulated moving bed, and stirred tank types.

Grading   Based on the result of examination at the end of term and the results of quizzes and reports imposed every week.

Course Goals   To understand kinetic analysis of chemical reactions utilized in the industry and procedure to design and operate industrial reactors.

Course Topics

Theme	Class number of times	Description
Gas-solid-catalyst reaction (1) Fundamentals	1	Commercial catalysts and industrial gas-solid-catalyst reactions are overviewed. Chemical reaction engineering fundamentals of the gas-solid-catalyst reaction is explained.
Gas-solid-catalyst reaction (2) Generalized effectiveness factor and selectivity in complex reactions	1	The generalized effectiveness factor and the selectivity affected by mass transfer are explained.
Gas-solid-catalyst reaction (3) Deactivation and regeneration of catalyst	2	Deactivation mechanisms of solid catalysts are overviewed. The deactivation and consequent change in selectivity are explained in terms of the decay function and specific activity.
Gas-solid-catalyst reaction (4) Design and operation of industrial catalytic reactors	1	Industrial catalytic reactors including fixed-bed and fluidized-bed reactors are overviewed. Design and operation of these reactors including thermal stability are explained.
Liquid-solid-catalyst reaction -- Simulated moving bed reactor	1	Concept and applications of simulated moving bed reactor are explained. Model-based analysis of simulated moving bed reactor is explained.
CVD reaction	2	Fundamentals of CVD reactions are explained from chemical reaction engineering view point. Kinetic analysis of CVD is described. Reaction models including elementary reaction model and overall reaction model are derived and applied to some examples.
Gas-solid reaction (1) Kinetic analysis	2	Kinetic measurement and analysis of complicated gas-solid reactions, particularly coal pyrolysis, are explained with the first-order reaction model to the distributed activation energy model (DAEM).
Gas-solid reaction (2) Kinetic analysis of gas-solid reaction	1	Concepts and derivation of the reaction models including the grain model and the random-pore model are explained. Application of the models to coal gasification is overviewed.

Textbook   Prints are hand out at the class.

Textbook(supplemental)

Prerequisite(s)   Needs knowledge of chemical reaction engineering including heterogeneous reactions.

Independent Study Outside of Class

Web Sites

Additional Information

Separation Process Engineeering, Adv.

Code   10H005   Course Year   Master and Doctor Course   Term   Class day & Period   Mon 2nd

Location   A2-305   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   H.Tamon, N.Sano,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to Advanced Material Science and Technology   English lecture

Code   10K001   Course Year   Master and Doctor Course   Term   First term/Spring term   Class day & Period   Fri 5th   Location   A2-306   Credits   First term: 2, Spring term: 1.5

Restriction   No Restriction   Lecture Form(s)   Relay Lecture   Language   English

Instructor   GL Edu. Center, J. Assoc. Prof., Ryosuke Matsumoto

Related professors

Course Description   The various technologies used in the field of material science serve as bases for so-called "high technologies", and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

Grading   Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site for more information. You can find an attachment file, "   2016   ", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Hyperthermophiles and their thermostable biomolecules	1	This lecture will first introduce the diversity and classification of life. It will then focus on hyperthermophiles and their thermostable molecules, such as proteins, nucleic acids and lipids.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Theoretical Design for Organic Light-Emitting Diode Materials	1	Organic light-emitting diodes have multilayer structures consisting of carrier-transporting layers and a light emitting layer. The concepts employed in desining these materials and their examples are discussed.(T. Sato: Dept. of Molecular Engineering)
In Vivo Optical and Photoacoustic Tumor Imaging using Near-infrared Dye-cinjugated Amphiphilic Polymers	1	Optical and photoacoustic imaging methods are one of the most powerful and noninvasive techniques with which to visualize organs as well as tumor tissues. In this lecture,students can learn the basic principles of molecular imaging as well as recent progress in this field.(K. Ohe: Dept. of Energy and Hydrocarbon Chemistry)
Charge Carrier Transport in Conjugated Molecular Materials	1	How can we facilitate effective charge carrier transport pathway in organic conjugated molecular materials? The major topic of the present lecture is the mechanism of charge carrier transport in conjugated molecular materials. After an overview of electronic structure of conjugated molecular materials based on band models, a variety of measurement techniques is introduced to probe charge carrier mobility in the materials, to figure out characteristic behavior of conjugated molecules (and their aggregates) as electric conductive materials.(S. Seki: Dept. of Molecular Engineering)
Rheology Control by Associating Polymers	1	Hydrophobically modified water-soluble polymers (associating polymers) have been used as rheology modifiers or thickeners because rheological properties of solutions and dispersions are drastically changed by the addition of small amounts of associating polymers. In this lecture, recent development on the molecular origin of the structure formation and rheological properties of associating polymers will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Materials Processing using external fields for microstructure control	1	Properties of materials are not simply determined by atomic structure and chemical composition. Microstructure (crystal grain size, crystallographic orientation and so on) significantly influences the properties. Not a few techniques have been developed for controlling the microstructure. Materials processing using external fields will be demonstrated in this class.(H. Yasuda: Dept. of Materials Science and Engineering)
Force acting on colloidal particles	1	Colloid means small particles dispersed in a liquid solvent. Theoretical approaches on several forces acting on colloidal particles such as thermal, hydrodynamic, and electrostatic forces will be discussed.(R. Yamamoto: Dept. of Chemical Engineering)
Photonic Crystal Technology	1	Photonic crystals are materials with periodic modulation of refractive index, in which a frequency range that existence of photon is prohibited (i.e. photonic band gap) can be formed. In this class, basics and applications of photnic crystals are introduced.(T. Asano: Dept. of Electronic Science and Engineering)
Modern Organic Synthesis for Material Science	1	The lecture will deliver recent developments in organic synthesis, particularly focusing on catalytic reactions that have revolutionized chemical processes, and their applications in the production of some important pharmaceuticals and organic materials.(Y. Nakao: Dept. of Material Chemistry)
Physical Organic Chemistry of Supramolecular Photofunctional Organic Materials	1	This lecture explains interesting behaviors of photofunctional organic materials, such as photochromic compounds and fluorescence dyes, in the aggregated and self-organized state from the viewpoint of physical organic chemistry.(K. Matsuda: Dept. of Synthetic Chemistry and Biological Chemistry)
Introduction to Nuclear Materials	1	Nuclear materials are designed for using in irradiation field of neutron and high-energy particles. Some topics of nuclear transmutation, thermonuclear fusion, boron neutron capture therapy and others will be talked.(I. Takagi: Dept. of Nuclear Engineering)
Directed Self-Assembly (DSA) of Block Copolymers	1	Recently, Directed Self-Assembly (DSA) technology of block copolymers has received a lot of attention in the field of semiconductor research. In this lecture, the fundamentals of microphase separation of block copolymers and the application of DSA to lithographic technologies will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Oxide Magnetic Materials	1	The aim of the lecture is to review the fundamentals and applications of oxide magnetic materials. Main topics include fundamentals of magnetism, magnetic properties of oxides, magneto-optics of oxides, oxides for spintronics, and multiferroic oxides.(K. Tanaka: Dept. of Material Chemistry)
Solar Hydrogen Production using Semiconductor Photocatalyst	1	The development of a clean and renewable energy carrier that does not utilize fossil fuels is a great technological challenge. Photocatalytic water splitting using semiconductor materials has attracted considerable interest due to its potential to cleanly produce H_2 from water by utilizing abundant solar light. In the present lecture, the basis and the recent progress in photocatalytic water splitting will be introduced.(R. Abe: Dept. of Energy and Hydrocarbon Chemistry)
Electrodeposition and Electroless Deposition for Materials Processing	1	(1)Fundamentals chemistry, electrochemistry, and thermodynamics , and (2)applications of electrodeposition and electroless deposition for materials processing.(K. Murase: Dept. of Materials Science and Engineering)

Textbook   None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Check the notice on the bulletin board.

Students who take Spring term (Lecture code 10H012) should attend first 11 lectures.

10K005

Advanced Modern Science and Technology　English lecture
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Code　10K005　Course Year　Master and Doctor Course　Term　　Class day & Period　Thu 5th　Location　A2-306　Credits　2(Semester system)　Restriction　No Restriction

Lecture Form(s)　Relay Lecture　Language　English

Instructor　　　GL　　　Edu.　　　Center,　　　J.　　　Assoc.　　　Prof.,　　　Ryosuke　　　Matsumoto　
Related professors

Course Description　Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. In addition to the understanding of each technology, the attendances learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development. Group discussions will be done for further understanding of the topics of the course.

Grading　Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site. You can find an attachment file, "　　　　　2016　　　　　　　　", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Who shake the dice?	1	Double slit phenomenon known as a prediction inability "quantum mechanics of the mystery (Feynman says)" can be every moment predicted by QED.(A. Tachibana: Dept. of Micro Engineering)
Exploration of Radiation Belts by Space Radio Engineering	1	Radiation belts of energetic particles are formed around magnetized planets such as the Earth, and they have been studied extensively by spacecraft missions and computer simulations for better understanding and utilization of the space plasma environment. We review historical development of space radio engineering and current understanding of radiation belt dynamics.(Y. Omura: Dept. of Electrical Engineering)
Systems Control in Aeronautics and Astronautics	1	Systems control theory is used in several problems in aeronautics and astronautics. This lecture focuses on some of them and further gives an overview of this research based on them.(K. Fujimoto: Dept. of Aeronautics and Astronautics)
Countermeasures of the Contaminated Water at Fukushima Daiichi Nuclear Power Station and that of the Contaminated Soil in Fukushima Area	1	The situation of contaminated water in Fukushima Daiichi Nuclear Power Station and soil contamination in and around Fukushima area and their technological countermeasures taken today will be introduced and discussed.(M. Yoneda: Dept. of Environmental Engineering)
Polymer Synthesis beyond the 21st Century: Precision Polymerizations and Novel Polymeric Materials	1	We are now in the "Polymer Age", where synthetic polymer materials are indispensable in the modern human life: healthy, safe, comfortable, and sustainable. A critical challenge herein is to develop "precision polymerization", polymer-forming reactions that provide polymers of well-defined structures and designed functions. Given these backgrounds, this lecture will overview the following subjects: (a)What polymers are; (b)How to synthesize polymers; (c)How and where polymeric materials work and function; (d)Precision polymer synthesis; and (e)The future of polymeric materials.(M. Sawamoto: Dept. of Polymer Chemistry)
Engineering Approach to Phase Behavior of Fluids Confined in Nanospace	1	Fluids confined in nano-scale pores exhibit peculiar phase behaviors that depends strongly on physico-chemical effects by pore walls and conditions of the bulk phase in equilibrium with the pore fluids, to which the engineering approach must be effective.(M. Miyahara: Dept. of Chemical Engineering)
Elucidation of Principles for the Self-organization of Mesoscale Colloidal Particles	1	The process of so-called the colloid crystal has been pursued to find out the key principles for the structure evolution, employing the Brownian dynamics simulations. Also given in the lecture will be various pattern formations in the convective self-assembly of colloidal suspensions.(M. Miyahara: Dept. of Chemical Engineering)
Architectural Design and Architectural Thinking	1	Architectural design is integration of thinking on architectural events and materials. I would like to discuss this architectural thinking and the method to embody it.(K. Takeyama: Dept. of Architecture and Architectural Engineering)
Genome sequences, what do they say and how can we use them?	1	Owing to the revolutionary advances in DNA sequencing technology, the complete genome sequences of a large number of organisms are now available. Here we will discuss what these genome sequences tell us and how we can use them to further increase our understanding of life.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Vacuum Nanoelectronics Devices in Harsh Environments	1	This lecture reviews the perspective of the modern vacuum electron devices based on miniaturized electron sources fabricated with contemporary semiconductor processes. The performance of the devices is evaluated in view of the device in harsh environments.(Y. Gotoh: Dept. of Electronic Science and Engineering)
Advanced Digital Technology for Analytical Recording of Cultural Heritage Assets	1	(A. Ide: Dept. of Mechanical Engineering and Science)
Protein Structure, Function, and Motion	1	Proteins work by fluctuating and changing their conformations. Protein structures and motions, which are essential for understanding their functions in detail, are introduced in conjunction with the state-of-art methods to analyze them.(K. Sugase: Dept. of Molecular Engineering)
Laser-induced Breakdown Spectroscopy and Its Application to Underwater In-situ Elemental Analysis	1	Development of laser-induced breakdown spectroscopy (LIBS) for in-situ elemental analysis in water, and the application to resource exploration at sea bottom will be explained.(T. Sakka: Dept. of Energy and Hydrocarbon Chemistry)
Micro- and Nano-scale Separations in Analytical Chemistry	1	Micro- and nano-scale high performance separation techniques, including capillary electrophoresis and microchip electrophoresis, will be discussed in terms of both fundamental characteristics and applications.(K. Otsuka: Dept. of Material Chemistry)
Modern Techniques for Material Characterization	1	Overview of modern techniques for material characterization is given with basic principles and practical applications. Impacts on the life of the people of characterization techniques are also included.(J. Matsuo: Dept. of Nuclear Engineering)

Textbook　None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information　Students who take Autumn term should register "Lecture code 10H006".

Frontiers in Modern Science & Technology

Code   10D051   Course Year   Master and Doctor Course   Term   Class day & Period   Wed 5th

Location Funai Hall   Credits   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10i045

Exercise in Practical Scientific English

Code   10i045   Course Year   Master and Doctor Course   Term   1st term

Class day & Period   Thu 4th or 5th   Location   A2-304   Credits   1

Restriction   Up to 20 students for each class   Lecture Form(s)   Seminar   Language   Japanese and English

Instructor   Y. Nakayama and T. Mizuno

Course Description   Students learn about the basics of technical writing in English, and learn about and practice the format, style, and mechanics of the scientific research article. We may restrict the class size to enhance learning. The course is shared by Master's and Doctoral Course students.

Grading   Students are required to submit an initial report and a mid-term report. Students failing to submit the mid-term report will be given no credit.

Course Goals   Students develop basic communication skills needed to work for international organizations through practicing scientific English writing.

Course Topics

Theme	Class number of times	Description
Course Outline and Introduction to Technical Writing	1	Students examine the aim and requirements of the course, and look at the key points for writing correctly, clearly, and concisely. (The class schedule may change without notice.)
Basics of Technical Writing	3	Students learn about the definition and basic rules for technical writing, and look at common mistakes made by non-native writers of English. Students also learn about basic English grammar.
Japanese-to-English Translation Practice	3	Students learn about English grammar and practice revising their English writing.
Paragraphs	2	Students learn about paragraphs: the topic sentence and supporting sentences, and techniques for sequencing information in a paragraph.
Format of Research Articles	3	Students learn about the standard format of a research article: the title, abstract, method, results, discussion, and conclusion.
Listening Practice	1	Students practice listening comprehension using videos presenting scientific and technical information.
Online Learning	2	Writing Paragraphs

Textbook   No text − all materials are supplied by the teachers.

Textbook(supplemental)   Yukiko Nakayama, Gijutsu kei Eibun Raithingu Kyohon (Technical Writing Textbook), Japan Society for Technical Communication
Anne M. Coghill and Lorrin R. Garson, The ACS style guide, 3rd, The American Chemical Society.

Prerequisite(s)   Students need to have basic English skills at undergraduate level.

Independent Study Outside of Class

Web Sites   http://www.glc.t.kyoto-u.ac.jp/ja/study/grad/10d040

Additional Information   We may restrict the class size to enhance students' learning. Students who intend to join the course are required to attend the first-day guidance.

Instrumental Analysis, Adv.

Code   10D043   Course Year   Master and Doctor Course   Term   1st term   Class day & Period

Location   A2-307   Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10D046

Instrumental Analysis, Adv.

Code   10D046   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period

Location   A2-307   Credits   1   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Experiments and Exercises on Bio-Medical Engineering, Adv. I

Code   10W681   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W683

Experiments and Exercises on Bio-Medical Engineering, Adv. II

Code   10W683   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Bio-Medical Engineering A(MC)

(

Code 10W670 Course Year Master Course Term 1st term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Bio-Medical Engineering A(MC)

Code 10W670 Course Year Master Course Term 1st term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Language Japanese Instructor ,

Seminar on Bio-Medical Engineering B(MC)

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Code   10W671   Course Year   Master Course   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Bio-Medical Engineering A

A

Code 10W685 Course Year Doctor Course Term 1st term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Bio-Medical Engineering B

B

Code   10W687   Course Year   Doctor Course   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Bio-Medical Engineering C

C

Code   10W689   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10W690

Seminar on Bio-Medical Engineering D

D

Code 10W690 Course Year Doctor Course Term 2nd term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Bio-Medical Engineering Internship M

M

Code   10W691   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Bio-Medical Engineering Internship D

D

Code 10W692   Course Year   Doctor Course   Term 1st+2nd term   Class day & Period   Location

Credits 2   Restriction   Lecture Form(s)   Language Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Professional Scientific Presentation Exercises　English lecture

Code　10i041　Course Year　Doctor Course　Term　1st term　Class day & Period　Wed 5th

Location　B-Cluster 2F Seminar Room　Credits　1

Restriction　The number of students might be limited if too many students will get enrolled.

Lecture Form(s)　Semina　　Language　English

Instructor　Juha Lintuluoto, Associate Professor, Department of Synthetic Chemistry and Biological Chemistry

Course Description　It is imperative for future engineers to be able to communicate and deliver effectively scientific information to large variety of audiences. This skill enables engineers to share and absorb information to more extended audiences, and facilitates success in selling ideas and products, publishing and team working. The purpose of this course is to teach the basic rules needed for successful professional scientific presentation, both orally and written. The course also prepares students to deliver scientific information presentations to wide audiences. The course is consisted of excessive exercises, of which the student should complete seven (7) tasks. The course holds 3-4 tasks for oral presentation exercises, and 3-4 tasks for professional scientific writing exercises. The exact number of both exercises is adjusted for each student's needs. The course is aimed for doctor course (DC) students, both Japanese and Foreign nationals

Grading　Reports, class activity, presentation

Course Goals　This course is aimed to foster engineering students' scientific presentation skills. The successfully course completed students will be able to express and present complicated and specific scientific information at more generally understandable level. The students will also be able to pose relevant questions and effectively answer to the wide variety of questions.

Course Topics

Theme	Class number of times	Description
	1	Guidance and Professional presentation rules and etiquette
	3	Oral presentations & questioning I, Written report I
	3	Oral presentations & questioning I, Written report I
	3	Oral presentations & questioning II, Written report II
	3	Oral presentations & questioning II, Written report II
	2	Oral presentations & questioning III, Written report III
		Oral presentations & questioning III, Written report III
		Oral presentations & questioning IV, Written report IV
		Oral presentations & questioning IV, Written report IV I
		Course summary and discussion

Textbook　Course materials will be provided.

Textbook(supplemental)　Will be informed if necessary.

Prerequisite(s)　-Fundamental skills about scientific presentation

-Advanced English skills

-Sufficient personal research results

Independent Study Outside of Class

Web Sites　The web-site is listed in the home page of the GL education center.

Additional Information　Students are requested to check in advance whether the credit of this course is counted as the unit for graduation requirement at department level. Course starts at April 13th, and the 1st lesson is repeated on April 20th. The course schedule is irregular. Most classes are biweekly, the detailed schedule is provided at the 1st lecture.

10i042

Advanced Engineering and Economy　English lecture

Code　10i042　Course Year　Master and Doctor Course　Term　1st term　Class day & Period　Tue 5th　Location　B-Cluster 2F Seminar Room

Credits　2　Restriction　The number of students might be limited if too many students will get enrolled.

Lecture Form(s)　Lectures, Group works&tasks　Language　English

Instructor　Juha Lintuluoto, Associate Professor, Department of Synthetic Chemistry and Biological Chemistry

Course Description　Engineering economics plays central role in any industrial engineering project. For an engineer, it is important to apply the engineering know-how with the economic analysis skills to obtain the best available materials, methods, devices, etc. in the most economical way. This course is aimed to teach engineering students the basic economic methods to manage economically an engineering project. In addition, the report writing on various engineering economic issues prepares to write reports in a professional form. The lab sessions are meant for the verbal skills improvement as well as improvement of analytical thinking. The topics are of current relevant topics Small-group brain-storming method is used. The exercise sessions cover the use of Ms-Excel for various quantitative economic analyses.

Grading　Final test, reports, class activity

Course Goals　This course is aimed to strengthen engineering students' skills in economics. The course concept is to teach students selectively those subjects which serve as major tools to solve economic tasks in engineering environment. The reports and lab sessions provide students stimulating and analytical thinking requiring tasks, and presentation skills training is an important part of this course.

Course Topics

Theme	Class number of times	Description
Student orientation and Introduction to engineering economy	1	
Cost concepts and design economics	1	
Cost estimation techniques	1	
The time value of money	1	
Evaluating a single project	1	
Comparison and selection among alternatives	1	
Depreciation and income taxes	1	
Price changes and exchange rates	1	
Replacement analysis	1	
Evaluating projects with the benefit-cost ratio method	1	
Breakeven and sensitivity analysis	1	
Probabilistic risk analysis	1	
The capital budgeting process	1	
Decision making considering multiattributes	1	
Final test	1	
		Additionally, students will submit five reports during the course on given engineering economy subjects. Also, required are the five lab participations (ca.60 min/each) for each student. Additionally, three exercise sessions (ca.60 min/each), where use of Ms-Excel will be practiced for solving various engineering economy tasks, should be completed

Textbook　Engineering Economy 15th ed. William G. Sullivan (2011)

Textbook(supplemental)　Will be informed if necessary.

Prerequisite(s)　-This course is highly recommended for those who attend " Engineering Project Management" course , Small group working method Independent Study Outside of Class

Web Sites　The web-site is listed in the home page of the GL education center.

Additional Information　Students are requested to check in advance whether the credits of this course are counted as the units for graduation requirement at department level. The course starts on Apr.12th.

10i047

Engineering Project Management   English lecture

Code   10i047   Course Year   Doctor Course   Term   1st term   Class day & Period   Fri 4th   Location   B-Cluster 2F Seminar Room

Credits   1   Restriction   Lecture Form(s)   Lectures, Group works&tasks   Language   English

Instructor   GL center: J.Assoc.Prof. Takatori, Mizuno, Tanaka, Matumoto

Assoc.Prof. Lintuluoto, J. Assoc.Prof. Nishi

Course Description   The purpose of this course is to teach the basic skills needed for expressing and initiating ideas, and presenting information in successful international engineering group work. The course provides simulations for students in group managing and decision making in international engineering teams. International teamwork ethics subjects for successful engineering project will be practiced. The course consists of lectures, case studies, the invited lecture from an industry representative and the final examination. Also, a project report exercise is included in this course.

The course is basically designed for doctor course (DC) students, both Japanese and foreign nationals. If place are available they may be given to master course students.

Grading   Report, class activity, presentation

Course Goals   This course is the pre-course for Engineering Project Management II which will be held in the second semester. Students will learn project management tools, apply project strategies and perform qualitative risk analyses. Also students will learn how to carry out projects with group members from various countries and engineering fields.

Course Topics

Theme	Class number of times	Description
Introduction to the course	1	4/8 The introduction to the course and preliminary knowledge about the engineering project management will be given. (All)
Project Management	1	4/15 I (Lintuluoto)
Project Management	1	4/22 II (Lintuluoto)
Management of abroad dispatched project	1	5/6 Through an abroad dispatched project of Graduate School of Engineering, Kyoto University, the development and management of the project in University will be given. (Mizuno)
TBA	1	5/13
Leadership Skills	1	5/20 I (Tanaka)
Leadership Skills	1	5/27 II (Tanaka)
Risk Identification and Assessment for Engineers	1	6/3 I (Nishi)
Risk Identification and Assessment for Engineers	1	6/10 II Products failure potentially causes serious economic and human damages. This lecture firstly overviews some mechanisms of failure, and introduces actual examples of failure accidents and their costs. And then, damage-tolerance-design methodology in which remaining life and inspection intervals are quantified through fracture mechanics analyses is explained.(Matsumoto)
Design and design thinking	1	6/17 I (Takatori)
Design and design thinking	1	6/24 II (Takatori)
Special Lecture from Industry	1	7/1
Special Lecture from Industry	1	7/8
Special Lecture from Industry	1	7/15
Review of the course	1	7/22 Review of the course

Textbook   Course materials will be provided.

Textbook(supplemental)

Prerequisite(s) ‘ -This course is recommended for those who later intend to attend " Engineering Project Management II ".

-Highly interactive lessons (discussion), Small group work methodologies.

Independent Study Outside of Class

Web Sites   The web-site will be opened in the home page of the GL education center.

Additional Information   Students are requested to check in advance whether the credit from this course will be accepted as a graduation requirement for their department. The course starts on Apr. 10th.

Engineering Project Management　　English lecture

Code　10i048　　Course Year　Doctor Course　　Term　2nd term　　Class day & Period　Fri 5th

Location　B-Cluster 2F Seminar Room　　Credits　1　　Restriction　Student number will be limited.

Lecture Form(s)　Seminar　　Language　English

Instructor　GL center: J.Assoc.Prof. Takatori, Mizuno, Tanaka, Matumoto, Ashida,

Assoc.Prof. Lintuluoto

Course Description　In this course, students will apply the engineering know-how and the skills of management, group leadership, and international communication which they learned in the course of "Engineering Project Management I" to build and carry out a virtual inter-engineering project. This course provides a forum where students' team-plan based on ideas and theories, decision making, and leadership should produce realistic engineering project outcomes. The course consists of intensive group work, presentations, and a few intermediate discussions. A written report will be required.

Grading　Report, class activity, presentation

Course Goals　This course prepares engineering students to work with other engineers within a large international engineering project. In particular this course will focus on leadership and management of projects along with applied engineering skills where the students learn various compromises, co-operation, responsibility, and ethics.

Course Topics

Theme	Class number of times	Description
Guidance	1	Introduction to Engineering Project Management 　Lecture on tools for the Engineering Project Management 　Practice
Practice I	2	Each student practices the tools for the Engineering Project Management
Group work I	2	Each project team may freely schedule the group works within given time frame. In addition to "Intermediate discussion" sessions, the course instructors are available if any such need is required.
Presentation I & Intermediate discussion I	1	Each project team has a presentation
Group work II	2	
Intermediate discussion II	1	
Group work III	2	
Presentation II	1	
Final discussion	1	

Textbook　Course materials will be provided.

Textbook(supplemental)　Will be informed if necessary.

Prerequisite(s)　Fundamental skills about group leading and communication, scientific presentation.

Independent Study Outside of Class

Web Sites　The web-site will be opened in the home page of the GL education center.

Additional Information　Students are requested to check in advance whether the credit from this course will be accepted as a graduation requirement for their department.

Prospects of Interdisciplinary Photonics and Electronics

Code   10X001   Course Year   Master Course   Term   1st term   Class day & Period   Fri 2nd   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X003

Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics

Code   10X003   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X005

Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics

Code   10X005   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X007

Advanced Seminar on Interdisciplinary Photonics and Electronics

Code   10X007   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Language   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Mechanics for Electronics Engineering

Code   10C825   Course Year   Master Course   Term   1st term   Class day & Period   Tue 3rd   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C800

Semiconductor Nanospintronics

Code   10C800   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 2nd   Location   A1-131

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English or Japanese (depends on students)

Instructor   Masashi Shiraishi

Course Description   Spintronics is now attracting tremendous attention, and is recognized as one of the most potential candidates to overcome the limit of the Moore's law. Spintronics possesses attractive and profound basis physics and also a potential to practical applications towards MRAMs and spin FETs. In this lecture, I introduce some important and basic theories and experimental techniques in spintronics using semiconductors, metals, insulators, oxides and so on.

Grading   Report submission

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction	1	Spin is a quantum quantity, and thus it is to induced by rotation of an electron (an electron is an elementary particle, i.e., it has no domain. Thus, rotation of an electron cannot be defined). Nevertheless, the spin degree of freedom can be coupled to spatial rotation because spin is a generator of infinitesimal rotation. I explain the essence of spin, its SU(2) algebra and so on.
Relativistic quantum physics and spin-orbit interaction	5	To understand spin manipulation and spin coherence in semiconductor, it is quite important what the spin-orbit interaction (SOI) is. The SOI is a manifestation of a relativistic effect, and the Dirac equation, the equation of motion in relativistic quantum physics, is derived to understand the SOI. Next, the SOI is explicitly derived be expanding the Dirac equation. As a related important topic, electron motion in graphene, which can be described as massless Dirac fermion, and the Berry phase (a geometric phase that plays an important role in spintronics) of electrons in graphene are discussed.
Electrical and dynamical spin injection into condensed matters and generation of pure spin current	5-6	Pure spin current is a quite significant physical current in spintronics using semiconductors and so on. Pure spin current is a current of only a spin degree of freedom without a net charge flow. I introduced some important papers and show how to derive essential equations describing generation and propagation of pure spin current. (1) Spin drift-diffusion equation, (2) Hanle-type spin precession, (3) spin pumping using magnetization dynamics, and (4) spin current circuit theory are discussed.
Recent topics in spintronics	2-3	Topological insulators and the Berry phase are important topics in modern spintronics. To understand the essence of them, I show the derivation of the Kubo formula, and the calculation of the Hall conductivity based on the Kubo theory. The above mentioned topics are the main contents of this lecture, but I may add or omit some topics as requests from students.

Textbook   None

Textbook(supplemental)   For foreign students, I recommend the following review articles: 1. "Spin Hall effect", J. Sinova et al., Rev. Mod. Phys. 87, 1213 (2015). 2. "Spintronics: Fundamentals and applications", I. Zutic et al., Rev. Mod. Phys. 76, 1 (2004). 3. "Nonlocal magnetization dynamics in ferromagnetic heterostructures", Y. Tserkovnyak et al., Rev. Mod. Phys. 77, 1375 (2005).

Prerequisite(s)   Solid State Physics and Quantum Physics at the level of undergraduate school.

Independent Study Outside of Class

Web Sites

Additional Information

Charged Particle Beam Apparatus

Code   10C801   Course Year   Master Course   Term   2nd term   Class day & Period   Wed 4th

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Yasuhito Gotoh

Course Description   Fundamental technologies of an ion beam system, such as ion sources, formation and evaluation of ion beams, transport of ion beams, and ion-solid interaction will be presented. Taking ion implantation as one of the example of the ion beam application, the relationship between the incident ion energy and implantation depth will be presented. Each element of a typical ion beam system is explained in detail.

Grading   Evaluation will be made with the results of final examination. Achievements of exercises in the class are also taken into consideration.

Course Goals   To understand the details of an ion beam apparatus: generation, transport and evaluation of an ion beam. Understanding of the entire ion beam apparatus as a system is also purpose of the class.

Course Topics

Theme	Class number of times	Description
Ion beam systems and their applications	1	Outline of the class is presented. Physical properties of ions in vacuum are given, and ion beam apparatuses and their application will be introduced with some typical examples.
Ion-solid interaction	3	Interaction between high energy ion and solid atoms are given. Major topics are: how the ions transfer their energy to the target atoms, i.e., how the ions are decelerated in the solid, and relationship between incident ion energy and implantation depth is given. Concept of sputtering phenomenon is also presented.
Nature of ion beam	2	Concept of the acceleration voltage is introduced to explain the principle of the ion beam systems. Nature of an ion beam is also presented.
Generation and transport of ion beam	3	Methods of ion generation for various elements are explained. Important equations of beam extraction and beam transport are given. Starting with the paraxial ray equation, concept of transfer matrix is given. Finally, some important physical parameters of ion beams are given.
Mass separators and energy analyzers	3	Details of magnetic sector as mass separator are given. Transfer matrix of the mass separator are presented and focusing effect is described. An important parameter of mass resolution is given. Some different kinds of energy analyzers are also introduced. Deflection and detection systems are also introduced.
Fundamentals of vacuum engineering	2	Fundamentals of vacuum engineering is given. Several pumps used for ion beam systems are also introduced.
Design of ion beam systems	1	Design of an ion beam system under a given condition will be presented. In the last class, achievment test will be performed.

Textbook   Yasuhito Gotoh, Charged Particle Beam Apparatus, 2016 version (to be sold at CO-OP shop in Katsura Campus)

Textbook(supplemental)   Junzo Ishikawa, Charged Particle Engineering (Corona).

Prerequisite(s)   Vacuum Electronic Engineering 1, 2 (undergraduate course)

Independent Study Outside of Class

Web Sites

Additional Information   We will have brief practice in each class. Bring your calculator and A4-size writing papers.

10C803

Quantum Information Science

Code   10C803   Course Year   Master Course   Term   1st term   Class day & Period   Mon 3rd

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English or Japanese   Instructor   Professor Shigeki Takeuchi

Course Description   An overview of the quantum information sciences will be given. The topics includes the basic picture of wave/particle duality, quantum key distribution, quantum computation, quantum communication, quantum measurements.

Grading   the number of days one has attended, and the score of reports will be considered.

Course Goals   To understand the basic concepts/mechanisms of quantum key distribution, quantum computers, and quantum metrology so that one can read and understand the scientific papers of the related area.

Course Topics

Theme	Class number of times	Description
Introduction		
Quantum Computer (Theory)		
Quantum Computer (Experiment)		
Quantum Key distribution and Quantum metrology		
Summary and Outlook		

Textbook   No text book will be used.

Textbook(supplemental)   Nielsen & Chuang, Quantum Computation and Quantum Information, Cambridge University Press

Prerequisite(s)   Basic understanding of quantum mechanics will be helpful.

Independent Study Outside of Class

Web Sites

Additional Information   We welcome your positive questions and comments.

Semiconductor Engineering Adv.

Code   10C810   Course Year   Master Course   Term   1st term   Class day & Period   Wed 3rd   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description   This course explores the fundamentals of physics of semiconductors, which are esseantial to understand semiconductor materials and devices.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Band theory	3-4	Electronic Band Structures are discussed. Nearly free electron and tight-binding approachs, k dot p theory, pseudopotential method are explained. Band structures of major semiconductors such as Si and GaAs are also discussed.
	3-4	
	3-4	
	3-4	

Textbook

Textbook(supplemental)   S. M. Sze Physics of Semiconductor Devices (Wiley Interscience)
P.Y.Yu and M. Cardona Fundamentals of Semiconductors (Springer)

Prerequisite(s)   Semiconductor engineering, quantum mechanics (undergraduate level)

Independent Study Outside of Class

Web Sites

Additional Information

10C813

Electronic Materials Adv.

Code 10C813 Course Year Master Course Term 2nd term Class day & Period Thu 2nd

Location A1-001 Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Semiconductors	6-7	
Superconductors	4-5	
Epitaxial growth	3-4	Semiconductor heterostructures are fabricated by using a crystal growth method called "epitaxy". Fundamentals of epitaxial growth are discussed. One of epitaxial growth methods, molecular-beam epitaxy, is discussed in detail.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Electronics

Code   10C816   Course Year   Master Course   Term   1st term   Class day & Period   Mon 5th

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Surface Electronic Properties

Code 10C819 Course Year Master Course Term 1st term Class day & Period Tue 5th Location

Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Instructor Hirofumi Yamada,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Optical Properties and Engineering

Code   10C822   Course Year   Master Course   Term   1st term   Class day & Period   Tue 4th   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2-3	
	7-8	
	4-5	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Optoelectronics Devices

Code   10C828   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 4th   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	5	
	5	
	4	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Optics

Code   10C829   Course Year   Master 1st   Term   1st term   Class day & Period   Tue 2nd

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	3	
	3	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Quantum Measurement

Code   10C830   Course Year   Master Course   Term   2nd term   Class day & Period   Mon 4th
Location   A1-131 (Katsura #2 lecture room)   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture
Language   Japanese, but there is a possibility of some lectures in English.   Instructor   Kazuhiko Sugiyama
Course Description   As an example of high precision measurements using quantum phenomena, frequency
standards, which is realized with the smallest uncertainty in all measurement quantities at present, are discussed.
The principle and evaluation of frequency standards are explained.
Grading   Report(two times, at the first lecture and the after all lectures)
Course Goals   The goal of this lecture is to understand that precision measurements are realized with
combination of the best technologies and is based on physics.
Course Topics

Theme	Class number of times	Description
Introduction and principle of time measurement	1	Two principles of time measurement: Reproducibility postulate and dynamic model
Fundamentals of atomic frequency standards	2.5	Atomic states, its energy shifts, high-resolution spectroscopy and high-sensitive detection
Cesium frequency standard and atom interferometer	2.5	Principle of Ramsey resonance and its interpretation as atom interferometer
Specification of frequency standards: evaluation methods and theoritical limit	2	Fundamentals of evaluation of frequency stability with Allan variance, and theoretical limit of frequency stability
Noise	2	Incoherent signals and shot noise
Relativistic theory and time	3	Impact of special and general relativistic theory on time measurement
Others	1	If we have time, the frequency noises of masers and lasers, and other subjects will be lectured.
Evaluation of understanding	1	

Textbook
Textbook(supplemental)   C. Audoin and B. Guinot,The Measurement of Time, (Cambridge University Press,
2001). M. Kitano, Fundamentals of electronic circuits (Reimei publishing, 2009) in Japanese.
Prerequisite(s)   Fundamentals of physics (quantum physics, in particular) and electric circuits including linear
system.
The level which average graduate students of electric and electronic science and technology acquire is sufficient.
Independent Study Outside of Class
Web Sites   https://www.kogaku.kyoto-u.ac.jp/lecturenotes/(Unfortunately, this web page is discontinued from
2014. New pages would appear on PandA system.)
Additional Information

Electrical Conduction in Condensed Matter

Code   10C851   Course Year   Master 1st   Term   1st term   Class day & Period   Wed 2nd

Location   Electrical Engineering Bldg.-Lecture Room (M)   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C834

High Performance Thin Film Engineering

Code   10C834   Course Year   Master 1st   Term   1st term   Class day & Period   Tue 1st   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Integrated Circuits Engineering, Advanced.

Code　693631　　Course Year　Master and Doctor Course　　Term　1st term　　Class day & Period　Wed 4th
Location　Electrical Engineering Bldg.-Lecture Room (M) etc.　　Credits　2　　Restriction　No Restriction
Lecture Form(s)　Lecture　　Language　Japanese　　Instructor　Hidetoshi Onodera

Course Description　　An integrated circuit is a key device that enables functionality enhancement,　performance increase, and cost reduction of an electronic system. Steady progress in fabrication technology leads to exponential increase in integration scale. This course focuses on the design methodology of a large-scale integrated circuit (LSI), with particular emphasis on logical and physical design process. Topics covered by the course include the current status and future directions regarding LSI design technology, CMOS process technology, CMOS layout design, CMOS device characteristics, CMOS static gates, CMOS dynamic gates, and LSI design methodology.

Grading　　The level of achievement will be examined by several reports assigned during lectures.　All reports are mandatory.

Course Goals　　The target of this lecture is to obtain basic knowledge on a design method of integrated circuits such that he/she can complete logic, circuit and layout design for a simple digital circuit.

Course Topics

Theme	Class number of times	Description
1. Current status and future directions of Integrated Circuit Technology	2	The current status of integrated circuit development will be explained. Brief history and future directions of integrated circuit technology will be covered.
CMOS Process Technology	2	Fabrication process of CMOS will be explained with particular emphasis on photo-masks required for lithography.
MOS Devices	3	Structure and performance characteristics of MOSFET, capacitor and resister will be explained. Performance degradation of scaled interconnect will be discussed with possible solutions.
CMOS Logic Gates	3	CMOS complementary static gates and dynamic gates will be presented with performance analysis and design methods.
LSI Design Methodology	3	Synchronous design method will be explained. Timing analysis and clocking techniques will be discussed. Low power design methodology will be explained.
FPGA	2	Field programmable gate array and its application will be explained.

Textbook　　N/A Hand-outs will be provided.

Textbook(supplemental)　　Neil H.E. Weste and David Harris, “　CMOS VLSI Design, 4th Ed.” Addison-Wesley, 2011.

Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, “　Digital Integrated Circuits, 2nd Ed.” Prentice Hall, 2003.

Prerequisite(s)　　Basic knowledge on electronic circuits, digital circuits, logic circuits.

Independent Study Outside of Class　　Reports include design and analysis of small circuits. A simulation program (SPICE) is required for performance analysis. Instructions for obtaining SPICE are given and students need to install SPICE by themselves.

Web Sites

Additional Information

State Space Theory of Dynamical Systems

Code   10C628   Course Year   Master Course   Term   1st term   Class day & Period   Wed 3rd   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese or English

Instructor   T. Hagiwara, Y. Ebihara

Course Description   The course deals with the dynamical system theory based on linear time-invariant state equations. It covers such topics as state equations, controllability and observability, mode decomposition and its relevance to controllability/observability, stability of dynamical systems, and the Kalman canonical decomposition.

Grading   The grading will be based on the exam.

Course Goals   To acquire the knowledge on the basic theory for linear system analysis by means of state equations.

Course Topics

Theme	Class number of times		Description
feedback systems and state equations	3	4	fundamentals of state equations, their relationship to transfer functions and block diagram representations
responses of linear systems	5	6	state transition matrices, equivalence transformation of systems, mode decomposition and Lyapunov stability
controllability and observability	5	6	controllability and observability, mode decomposition and its relevance to controllability/observability, controllable subspace and unobservable subspace, and the Kalman canonical decomposition; Checking degrees of understanding of all the lecture topics closes the class.

Textbook

Textbook(supplemental)

Prerequisite(s)   classical control theory (in terms of transfer functions), linear algebra and calculus

Independent Study Outside of Class

Web Sites

Additional Information   Handouts will be given at the class.

Applied Systems Theory

Code   10C604   Course Year   Master 1st   Term   2nd term   Class day & Period   Tue 1st

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   E. Furutani

Course Description   The course deals with mathematical methods of system optimization mainly for combinatorial optimization problems. It covers such topics as the integer optimization and its typical problems, exact solution methods including the dynamic programming and the branch and bound method, approximate solution methods including the greedy method, meta-heuristics including the genetic algorithms, the simulated annealing method, and the tabu search.

Grading   In principle, the grading will be based on the absolute and comprehensive evaluation of the reports on the subjects given in the class.

Course Goals   To acquire the knowledge on formulation of combinatorial optimization problems into integer programming problems, basic concepts, algorithms, characteristics, and application procedures of exact solution methods, approximate solution methods, and meta-heuristics.

Course Topics

Theme	Class number of times	Description
combinatorial optimization problems and complexity	1-2	necessity and importance of combinatorial optimization, typical problems, complexity, classes P and NP, complexity of combinatorial optimization problems, limitation of exact solution methods, necessity of approximate solution methods and meta-heuristics
exact solution methods	3	principle of optimality, dynamic programming, branch and bound method, and their applications
integer programming	2-3	formulation into integer programming problem, relaxation problem, and cutting plane algorithm
approximate solution methods	1-2	greedy method, relaxation method, partial enumeration method, etc.
meta-heuristics	5-6	local search, basic ideas of meta-heuristics, genetic algorithms, simulated annealing method, tabu search, etc. Checking degrees of understanding of all the lecture topics closes the class.

Textbook

Textbook(supplemental)   M. Fukushima: Introduction to Mathematical Programming (in Japanese), Asakura, 1996.

Y. Nishikawa, N. Sannomiya, and T. Ibaraki: Optimization (in Japanese), Iwanami, 1982.

M. Yagiura, and T. Ibaraki: Combinatorial Optimization ---With a Central Focus on Meta-heuristics--- (in Japanese), Asakura, 2001.

B. Korte, and J. Vygen: Combinatorial Optimization ---Theory and Algorithms, Third Edition, Springer, 2006.

Prerequisite(s)   linear programming, nonlinear programming

Independent Study Outside of Class

Web Sites

Additional Information   Handouts and exercises are given at the class.

Applied Mathematics for Electrical Engineering

Code   10C601   Course Year   Master Course   Term   1st term   Class day & Period   Thu 1st

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   T. Hikihara & S. Doi,

Course Description   In the class, fundamental mathematics is lectured for electrical engineering, electronics, system engineering, and material science. In particular, system theory, nonlinear dynamics, and particle dynamics in force field can be discussed with mathematical clear image.

Grading   Students are requested to reply to report assignments. The grading is based on the evaluation of the reports.

Course Goals   Professors expect students to model their system and analyze the models theoretically. Students will be requested to understand their system in principle mechanics and control them based on system theory.

Course Topics

Theme	Class number of times	Description
	1	
	2-4	
	3-5	
Introduction 2	1	Relationship between the previous classes and further will be explained. The introduction to nonlinear dynamics will be explained based on oscillation theory.
Hamiltonian mechanics	1-3	Hamiltonian mechanics on linear symplectic space is lectured.
Manifold and vector field	2-4	Manifold is discussed in nonlinear system with relation to vector filed analysis.

Textbook

Textbook(supplemental)   S. Wiggins, Introduction to Applied Nonlinear Dynamical Systems and Chaos, Springer-Verlag.

Prerequisite(s)   Linear algebra

Independent Study Outside of Class

Web Sites   https://www.t.kyoto-u.ac.jp/lecturenotes/gse/kueeng/10C601/syllabus

Additional Information   Appropriate references will be shown in classes.

Electrical and Electromagnetic Circuits

Code   10C647   Course Year   Master 1st   Term   1st term   Class day & Period   Wed 2nd

Location   A1-001 (Katsura)   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Osami Wada, Professor, Department of Electrical Engineering

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Guidance	1	
Circuit description including electromagnetic coupling effects	2	
Evaluation and description methods for high-frequency circuits	2	
Transmission line and its characteristics (1)	2	
Transmission line and its characteristics (2)	2	
Description of electromagnetic couplings	2	
E-system integrity design technology for electric and electronic systems	3	
Final exam and feedback	1	

Textbook   Materials for this course will be distributed at the lectures.

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Electromagnetic Theory, Adv.

Code 10C610 Course Year Master 1st Term 2nd term Class day & Period Wed 3rd Location

Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor T. Matsuo,

Course Description The first half: the special theory of relativity and the covariance of Maxwell's equations
The latter half: the differential form in the electromagnetic field theory and its application to computational electromagnetics

Grading Submission of reports (twice)

Course Goals 1. Understanding of the basic concepts of special theory of relativity and the covariant formulation of Maxwell's equations
2. Understanding of the basics of differential form in electromagnetic field theory

Course Topics

Theme	Class number of times	Description
Introduction to special theory of relativity	2-3	- Galilean relativity and special relativity - Lorentz transformation
Tensor representation and relativistic dynamics	2-3	- Introduction to tensor representation - Relativistic dynamics
Covariant formulation of Maxwell's equations	2-3	- Electromagnetic field tensor - Lorentz covariance of Maxwell's equations
Differential form in electromagnetic field theory	3-4	- Basics of differential form in electromagnetic field theory
Application to computational electromagnetics	3-4	- Application of integral form of Maxwell's equations to computational electromagnetics

Textbook

Textbook(supplemental) Y. Kazama, Introductory Lectures on the Theory of Relativity (in Japanese), Baifukan,1997.

Prerequisite(s) Basic electromagnetic theory

Independent Study Outside of Class

Web Sites

Additional Information

Superconductivity Engineering

Code   10C613   Course Year   Master Course   Term   1st term   Class day & Period   Mon 4th   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C614

Biological Function Engineering

Code   10C614   Course Year   Master Course   Term   2nd term   Class day & Period   Wed 2nd

Location   A1-001(1)   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Tetsuo Kobayashi,Shoji Hamada,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Basics of nervous system	2	Study about detail structure of the human brain to understand higher brain functions. In particular, learn about cortical structure and functional map.
Neurones and glial cells	1	Study about detail structures and functions of neuron and glial cells.
Neuroimaging techniques	3	Study about measurement principles and analytical methods of representative non-invasive neuro-imaging techniques.
Sensory functions	2	Study about organizations of sensory systems such as visual, auditory and somatosensory systems.
Motor functions	1	Study about organizations and functions of primary motor, premotor and supplementary motor areas.
Electromagnetic fields in biological body	2	Physical phenomena inside and outside biological body caused by external and internal electromagnetic fields and electric currents.
Electromagnetic field analysis in biological body	2	Basics of electromagnetic field analysis in biological body. Characteristics of conductivity and permittivity of biological tissues.
Electrical and magnetic stimulation	1	Transcranial magnetic stimulation and deep brain stimulation.
Evaluation of understanding	1	We are going to check students' achievement by answering questions from students.

Textbook

Textbook(supplemental)   Tetsuo Kobayashi, Isamu Ozaki and Ken Nagata (eds.): "Brain topography and multimodal imaging", (Kyoto Univ. Press, 2009)

Prerequisite(s)   Electricity and magnetism, Fundamentals of biomedical engineering

Independent Study Outside of Class

Web Sites

Additional Information

Applied Hybrid System Engineering

Code   10C621   Course Year   Master Course   Term   1st term   Class day & Period   Location   A1-001

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language

Instructor   Takashi Hikihara,Shinji Doi,Yoshihiko Susuki,Syun'ichi Azuma,

 Course Description   Many engineering systems show hybrid dynamical structure, which is accompanied with discrete change of vector flow by control and regulate the trajectory to target dynamically. In the course, the fundamental characteristics and theorems are lectured. The framework of hybrid system, automaton model, and singular perturbation theorem are explain. Dynamic quantizer, power system, and network are picked up as examples.

 Grading   Exercise and repots are evaluated.

 Course Goals   Students are requested to understand the characteristics of hybrid system, approaching method, and control methods.

 Course Topics

Theme	Class number of times	Description
Fundamentals of hybrid system	4	As fundamentals, the definition of hybrid system and the method of modeling is explained.
Singular perturbation and asymptotic expansion	3	Singular perturbation theorema and asymptotic expansion are explained. For the global oscillation of singular perturbed system, analytical and geometrical singular perturbation methods are introduced.
Application of hybrid system-1: power system	3	The application to power system is explained. The outline of power system, then safety and examination, the stability analysis, and the modeling towards control are given.
Application of hybrid system-2: dynamic quantizer	2	As an application, dynamic quantizer is adopted. The outline of the dynamic quantizer, the analysis, and the design of the system are given.
Application of hybrid system-3: networking	3	As an application, the communication network is adopted. The internet network is also explained as an example of modeling and control.

 Textbook   Each professors prepare the prints of lectures.

 Textbook(supplemental)   No textbook.

 Prerequisite(s)   Nothing.

 Independent Study Outside of Class

 Web Sites

 Additional Information   This course is held every two years. The classes will be held on Wednesday or Thursday. Schedule is 4/13,20,27 [Hikihara]   5/11,18,25 [Azuma]   6/1,6/8 [Hikihara]
6/16,6/23,30, 7/7,14 (Thursday)[Doi]   7/21 [extra]

Theory of Electric Circuits, Adv.

Code   10C625   Course Year   Master Course   Term   2nd term   Class day & Period   Mon 2nd

Location   A1-001   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese and English   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction	1	
Modeling by circuit	4	
Circuit equation	4	
Phenomena in circuit	3	
Property of circuit	2	
Achievement test	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design of Control Systems

Code   10C631   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 2nd   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese or English

Instructor   T. Hagiwara, Y. Ebihara

Course Description   The course is based on State Space Theory of Dynamical Systems, and provides the applications of the concepts given therein to systematic control system design. The course covers such topics as state feedback and pole assignment, observers, synthesis of feedback control systems, servo conditions and feedforward, and optimal control under quadratic performance indices.

Grading   In principle, the grading will be based on the absolute and comprehensive evaluation of the reports on the subjects given in the class. Should this change due to inadequate efforts on the submitted reports, an exam might be also imposed, in which case the details will be announced at the class at least two weeks before the exam term.

Course Goals   To understand the basic ideas of control system design based on state space representations, and acquire fundamental knowledge and skills on practical control system design through simulated experiences with the report subjects.

Course Topics

Theme	Class number of times		Description
pole assignment by state feedback	4	5	state feedback, controllable canonical forms and pole assignment of scalar/multivariable systems, computation of the state feedback gains for pole assignment, transient responses, uncontrollable poles and stabilizability
observers	3	4	observable canonical forms and observability conditions, full-order observer, minimal-order observer, conditions for observers and observer-based feedback
synthesis of feedback systems	2	3	feedback systems with integral compensation, servo systems, internal model principle, synthesis of servo systems
optimal control under quadratic performance index	3	4	optimal regulators and their closed-loop poles, Riccati equations and their solutions, relationship with the pole assignment problem; Checking degrees of understanding of all the lecture topics closes the class.

Textbook   Handouts will be given at the class.

Textbook(supplemental)

Prerequisite(s)   The contents given in State Space Theory of Dynamical Systems, and linear algebra.

Independent Study Outside of Class

Web Sites   (Info) http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/matlab-octave.html

Additional Information

10C616

Electric Power Transmission System

Code   10C616   Course Year   Master Course   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Computer Simulations of Electrodynamics

Code   10C611   Course Year   Master 1st   Term   1st term   Class day & Period   Tue 5th

Location   A1-101/Electrical Engineering Bldg.-Lecture Room (M)/Uji Campus(Remote Lecture Room)   Credits   2

Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Variables and Classification of Simulation Codes	1	
Finite Difference Methods	1	
Difference Form of Maxwell's Equation and Grid Assignment / Time Step Chart	1	
Courant Condition	1	
Electromagnetic Radiation from a Thin Current	1	
Buneman-Boris Method for Equation of Motion (Relativistic Eqs.)	1	
Interporation of Electromagnetic Field	1	
Computatin of Charge and Current Densities, Self-force Cancellation	1	
Initilization of Particles and Fields	1	
Renormalization and Diagnostics	1	
Advection/Wave Equation for 1D Case (FTCS, Lax, Upwind and Lax-Wendroff Methods)	1	
von Neumann Stability Analysis	1	
Limiter Function	1	
Advection/Wave Equation for Multi-Dimensional Case	1	
Vlasov Equation	1	

Textbook

Textbook(supplemental)   (1) H. Matsumoto and Y. Omura, Computer Space Plasma Physics: Simulation Techniques and Softwares, Terra Scientific, Tokyo, 1993.

(2) H. Usui and Y. Omura, Advanced Methods for Space Simulations, Terra Pub, 2007.

Prerequisite(s)   Electrodynamics, Vector Analysis, Computer Language

Independent Study Outside of Class

Web Sites

Additional Information

10C612

Space Radio Engineering

Code   10C612   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 3rd

Location   N1 lecture room in the Faculty of engineering building No. 3, A1-131 in Katsura campus, Uji

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language

Instructor   Hiroshi Yamakawa, Hirotsugu Kojima,

Course Description   The present lecture provides the guideline how the technology on the electronics and propulsion system is used for the development of spacecraft and space systems. Furthermore, in order to understand the environment in space, we also give a lecture on the space plasma physics.

Grading   attendance and final examination

Course Goals   Mastery of the way how we can make use of the knowledges of the physics and technology to the space engineering.

Course Topics

Theme	Class number of times	Description
Space environment	2	The space environment in the view point of spacecraft desing such as thermal condition, plasmas, and charging.
Spacecraft system and its related technology	5	The spacecraft system and its technology related to power system, communication system, EMC, and payload desings.
Spacecraft dynamics	3	Spacecraft orbit design and its attitude control
System engineering of spacecraft	4	Spacecraft propulsion system including the advanced systems which make use of solar power, GPS navigation system, and space debris
Feedback	1	We will give a feedback lecture by answering to questions from students.

Textbook

Textbook(supplemental)

Prerequisite(s)   Plasma physics, Electromagnetics. Radio engineering, Electronics

Independent Study Outside of Class

Web Sites

Additional Information

Applied Microwave Engineering

Code   10C617   Course Year   Master Course   Term   1st term   Class day & Period   Tue 4th

Location   (Katsura)A1-131, (Yoshida)N1, (Uji)S-143H   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   (RISH) Shinohara,(RISH) Mitani,

Course Description   This lecture picks up microwave power transmission (MPT) technology, rectifying antenna (rectenna), antenna and propagation for the MPT, microwave transmitters, and some MPT applications like the Space Solar Power Satellite/Station. This lecture also picks up the other wireless power transmission technologies like resonnance coupling, energy harvesting, and applied microwave technologies of microwave processing, wireless communications, and radar.

Grading   Reports

Course Goals   Students learn about applied microwave engeering, mainly microwave power transmission.

Course Topics

Theme	Class number of times	Description
Introduction	1	The purpose and constitution of the lecture, and review of microwave engineering are explained.
Applications of Wireless Power Tramsmission	3-4	Space Solar Power Satellite/Station and Ubiquitous power source as applications of microwave power transmission, the resonance coupling and energy harvesting as the other battery-less technologies are explained.
rectifying antenna (rectenna)	1-2	rectifying antenna (rectenna) for the MPT are explained.
antenna and propagation for the MPT	5-6	Calculation of beam collection efficiency and beam propagation with FDTD method are explained. Phased array technologies, beam targetting method, non linear physics of microwave-plasma interation are overviwed.
Microwave transmitters	2	High efficient semi-conductor amplifiers and microwave tubes are explained.
microwave processing, wireless communications, and radar	2	Microwave processing, wireless communications, and radar texhnologies are explained.

Textbook   Naoki Shinohara, "Solar Power Satellite (in Japanese)", ISBN978-4-274-21233-8, Ohm-Sya

Textbook(supplemental)   Naoki Shinohara and Kimiya Komurasaki, "Wireless Power Transmission Technologies - Inductive Coupling, Resonance Coupling and Microwave Power Transmission - (in Japanese)", ISBN978-4-904-77402-1, Kagaku-Gijutsu-Syuppan

Prerequisite(s)   Microwave engineering

Independent Study Outside of Class

Web Sites

Additional Information   Number of the lectures may change.

Spacio-Temporal Media Analysis

Code   10C714   Course Year   Master Course   Term   1st term   Class day & Period   Tue 3rd

Location   3   N1   A1-131   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese or English   Instructor   Yuichi Nakamura, Kazuaki Kondo

Course Description   Representation, feature extraction, recognition of media with two or higher dimensions, especially images and videos, are explained with comparing to human vision and biological systems.

Grading   Evaluation is based on participation and reports.

Course Goals   To learn the basic of representation, feature extraction, and pattern recognition of signals with two or higher dimension, and their applications.

Course Topics

Theme	Class number of times	Description
Spatio-Temporal Media	1	What is spatio-temporal media. Some examples.
Light and Colors	1-2	Intensity, colors, and spectrum in image media.
Features and Segmentation	2	Features such as edge, region, etc. for analysing image media.
Filtering and Wavelet Transform	1-2	Introduction to filtering and Wavelet Transform.
Discrete Wavelet Transform and Applications	1-2	Dicrete Wavelet Transform and applications such as image enhancement, image compression, etc.
Geometry of Image Capturing	1-2	The mechanism and geometry of image capturing: projection of a 3D world into 2D images.
3D Measurements and Reconstruction	2	3D measurements and 3D world reconstrunction from a set of 2D images.
Measurement of Motions	1-2	Motion detection and measurement, and oject tracking.
Pattern Recognition	0-2	The basic idea of pattern recognition and usuful tools such as Support Vector Machine.

Textbook   No specific textbooks. Handouts will be given when necessary.

Textbook(supplemental)   Computer Vision: A Modern Approach, Forsyth and Ponce, Prentice Hall

Prerequisite(s)   Fundamental knowledge of digital signal processing

Independent Study Outside of Class

Web Sites   Please see PandA (https://panda.ecs.kyoto-u.ac.jp/portal).

Additional Information

Visualized Simulation Technology

Code   10C716   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 4th   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10G021

Engineering Optics and Spectroscopy

Code   10G021   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Masahiro Hasuo, Taiichi Shikama

Course Description   Optics are widely used in many areas of modern science and technology. Students will learn the physical properties of light and light-matter interactions, and their applications. Topics such as light propagation in dielectric media, crystal optics, quantum optics, and lasers will be explored. Interactions of light with atoms, molecules and solids as examples will be also explored with introduction of the fundamentals of spectroscopy and their applications.

Grading   Grade evaluation will be based on report examination.

Course Goals   Understand the principles of optical engineering and spectroscopy.
Develop application abilities based on the principle understanding.

Course Topics

Theme	Class number of times	Description
Dispersion of light	6	propagation of light in dielectric media (Lorentz model), crystal optics, nonlinear optics
Quantum optics	1	quantum theory of light, principles of lasers
Light-matter interactions	5	light-induced transition, quantum states of atoms, molecules, and solids, and rules governing the transitions (selection rules)
Selection rules and group theory	2	introduction to group theory and its application to the selection rules
Confirmation of the achievement	1	

Textbook   Recommended books will be discussed in class.

Textbook(supplemental)   Lecture notes will be distributed.

Prerequisite(s)   Undergraduate-level electromagnetism and quantum mechanics.

Independent Study Outside of Class

Web Sites

Additional Information

Physical Properties of Crystals Adv.

Code   10C263   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   Engineering Science Depts Bldg.-112   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C271

Magnetism and magnetic materials

Code   10C271   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 2nd

Location   Engineering Science Depts Bldg.-112   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Micro Process and Material Engineering

Code   10G203   Course Year   Master Course   Term   1st term   Class day & Period   Mon 4th

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   H. Kotera,O. Tabata,K. Eriguchi,I. Kanno,T. Tsuchiya,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Semiconductor microfabrication	3	
Thin-film process and evaluation	3	
Silicon micromachining	3	
3D lithography	3	
Soft-micromachining	2	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10C074

Quantum Science

Code 10C074 Course Year Master and Doctor Course Term 2nd term Class day & Period Tue 1st

Location C3-Lecture Room 5 Credits 2 Restriction No Restriction Lecture Form(s) Lecture

Language Japanese Instructor ,

Course Description This course involves fundamental interactions of electrons, ions and photons to atoms, molecules and condensed matters, and practical applications for nanotechnology. Great emphases are on fundamental mechanisms of beam-solid interactions, characterization techniques, material synthesis and processing for quantum devices with quantum beam. Recent progress of related area of quantum beam will be also introduced in this course.

Grading Coursework will be evaluated with attendance and report on subjects.

Course Goals To provide students to understand fundamental interactions in quantum science.

Course Topics

Theme	Class number of times	Description
Interactions between quantum beams and solids	7	Interactions between quantum beams and solids are described with various formulas. Collisions with nucleus, electronic excitation, defect formation and energy loss will be discussed and related scientific topics, such as discovery of electron will be introduced.
Applications of quantum beams	7	The interactions of quantum beam are widely used for various applications. Material processing and analysis with quantum beams are essential in nanotechnology and quantum beams are also important for diagnostics of diseases and cancer therapy in medical field. Practical applications will be presented with recent progress and challenges.
Final examination and report	1	Evaluation will be given by the contents of the reports and quizzes of the subjects leaned in this course.

Textbook Ion-Solid Interactions: Fundamentals and Applications (Cambridge Solid State Science Series) M. Nastasi, J. Mayer, J. Hirvonen

Textbook(supplemental)

Prerequisite(s) Solid state physics, Quantum mechanics(beginner's), Electromagnetism

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Materials

Code   10H413   Course Year   Master and Doctor Course   Term   (not held; biennially)

Class day & Period   Wed 2nd   Location   A2-304   Credits   1.5   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   A. Ito

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	4	
	3	
	4	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Materials Science

Code   10H422   Course Year   Master and Doctor Course   Term   Class day & Period   Wed 2nd

Location   ICR N-338C   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Kaji, Goto

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Chemistry of Polymer Materials

Code   10H007   Course Year   Master Course   Term   Class day & Period   Fri 2nd   Location   A2-302

Credits   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	2	
	6	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H613

Polymer Structure and Function

Code   10H613   Course Year   Master Course   Term   2nd term   Class day & Period   Thu 2nd

Location   A2-307   Credits   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   H. Ohkita

Course Description   In this class, optoelectronic functions of polymeric materials are discussed on the basis of photochemistry and photophysics. In particular, the importance of designing nanostructures of polymer assembly is highlighted by explaining examples of state-of-the-art applications, which include optical fibers, organic light-emitting diode, and organic solar cells.

Grading   Evaluated with the grade on the final test or the quality of report submitted after the final class.

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction	1	
Conductive Polymers	3	
Photofunctional Polymers	3	
Optoelectronic Polymers	4	

Textbook   None: Some handouts will be dealt in the class of every lecture.

Textbook(supplemental)   None:

Prerequisite(s)   Students are expected to have knowledge of Physical Chemistry and Polymer Chemistry provided in chemisty course for undergraduate.

Independent Study Outside of Class

Web Sites

Additional Information

Digital Signal Processing, Advanced

Code   693637   Course Year   Master Course   Term   1st term   Class day & Period   Wed 3rd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Instructor   Toru Sato

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   For the syllabus of this course, refer to KULASIS->Graduate School of Informatics->Digital Signal Processing, Advanced

Digital Communication Engineering

Code   693622   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 2nd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Information Network

Code   693628   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,,

Course Description   This course introduces architecture of information networks including communication protocol and layered structure.   Various networks and their technologies, such as circuit switching network, IP network, photonic network, and mobile network, are explained.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	5	
	3	
	1	
	1	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   http://www.i.kyoto-u.ac.jp/curriculum/syllabus.html

Recent Advances in Interdisciplinary Photonics and Electronics

Code   10X009   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 5th

Location   A1-131   Credits   2   Restriction   Lecture Form(s)   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X015

Advanced Seminar in Interdisciplinary Photonics and Electronics ,

1(   )

Code 10X015   Course Year Master Course   Term 1st term   Class day & Period   Location

Credits 2   Restriction   Lecture Form(s) Exercise   Language Japanese   Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X017

Advanced Seminar in Interdisciplinary Photonics and Electronics ,

2( )

Code 10X017 Course Year Master Course Term 1st term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Exercise Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Research Internship (M,D)

M(   )

Code   10X019   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X021

Research Internship (M,D)

D(   )

Code   10X021   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Exercises on Interdisciplinary Photonics and Electronics I, II

1

Code   10X023   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X025

Advanced Exercises on Interdisciplinary Photonics and Electronics I, II

2

Code 10X025   Course Year   Doctor Course   Term 1st+2nd term   Class day & Period   Location

Credits 2   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Frontiers in Modern Science & Technology

Code   10D051   Course Year   Master and Doctor Course   Term   Class day & Period   Wed 5th

Location   Funai Hall   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Exercise in Practical Scientific English

Code   10i045   Course Year   Master and Doctor Course   Term   1st term

Class day & Period   Thu 4th or 5th   Location   A2-304   Credits   1

Restriction   Up to 20 students for each class   Lecture Form(s)   Seminar   Language   Japanese and English

Instructor   Y. Nakayama and T. Mizuno

Course Description   Students learn about the basics of technical writing in English, and learn about and practice the format, style, and mechanics of the scientific research article. We may restrict the class size to enhance learning. The course is shared by Master's and Doctoral Course students.

Grading   Students are required to submit an initial report and a mid-term report. Students failing to submit the mid-term report will be given no credit.

Course Goals   Students develop basic communication skills needed to work for international organizations through practicing scientific English writing.

Course Topics

Theme	Class number of times	Description
Course Outline and Introduction to Technical Writing	1	Students examine the aim and requirements of the course, and look at the key points for writing correctly, clearly, and concisely. (The class schedule may change without notice.)
Basics of Technical Writing	3	Students learn about the definition and basic rules for technical writing, and look at common mistakes made by non-native writers of English. Students also learn about basic English grammar.
Japanese-to-English Translation Practice	3	Students learn about English grammar and practice revising their English writing.
Paragraphs	2	Students learn about paragraphs: the topic sentence and supporting sentences, and techniques for sequencing information in a paragraph.
Format of Research Articles	3	Students learn about the standard format of a research article: the title, abstract, method, results, discussion, and conclusion.
Listening Practice	1	Students practice listening comprehension using videos presenting scientific and technical information.
Online Learning	2	Writing Paragraphs

Textbook   No text − all materials are supplied by the teachers.

Textbook(supplemental)   Yukiko Nakayama, Gijutsu kei Eibun Raithingu Kyohon (Technical Writing Textbook), Japan Society for Technical Communication

Anne M. Coghill and Lorrin R. Garson, The ACS style guide, 3rd, The American Chemical Society.

Prerequisite(s)   Students need to have basic English skills at undergraduate level.

Independent Study Outside of Class

Web Sites   http://www.glc.t.kyoto-u.ac.jp/ja/study/grad/10d040

Additional Information   We may restrict the class size to enhance students' learning. Students who intend to join the course are required to attend the first-day guidance.

10K001

Introduction to Advanced Material Science and Technology　English lecture

Code　10K001　Course Year　Master and Doctor Course　Term　First term/Spring term　Class day & Period　Fri 5th　Location　A2-306　Credits　First term: 2, Spring term: 1.5

Restriction　No Restriction　Lecture Form(s)　Relay Lecture　Language　English

Instructor　GL Edu. Center, J. Assoc. Prof., Ryosuke Matsumoto

Related professors

Course Description　The various technologies used in the field of material science serve as bases for so-called "high technologies", and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

Grading　Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site for more information. You can find an attachment file, "　　　　2016　　　　　　　　", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Hyperthermophiles and their thermostable biomolecules	1	This lecture will first introduce the diversity and classification of life. It will then focus on hyperthermophiles and their thermostable molecules, such as proteins, nucleic acids and lipids.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Theoretical Design for Organic Light-Emitting Diode Materials	1	Organic light-emitting diodes have multilayer structures consisting of carrier-transporting layers and a light emitting layer. The concepts employed in desining these materials and their examples are discussed.(T. Sato: Dept. of Molecular Engineering)
In Vivo Optical and Photoacoustic Tumor Imaging using Near-infrared Dye-cinjugated Amphiphilic Polymers	1	Optical and photoacoustic imaging methods are one of the most powerful and noninvasive techniques with which to visualize organs as well as tumor tissues. In this lecture,students can learn the basic principles of molecular imaging as well as recent progress in this field.(K. Ohe: Dept. of Energy and Hydrocarbon Chemistry)
Charge Carrier Transport in Conjugated Molecular Materials	1	How can we facilitate effective charge carrier transport pathway in organic conjugated molecular materials? The major topic of the present lecture is the mechanism of charge carrier transport in conjugated molecular materials. After an overview of electronic structure of conjugated molecular materials based on band models, a variety of measurement techniques is introduced to probe charge carrier mobility in the materials, to figure out characteristic behavior of conjugated molecules (and their aggregates) as electric conductive materials.(S. Seki: Dept. of Molecular Engineering)
Rheology Control by Associating Polymers	1	Hydrophobically modified water-soluble polymers (associating polymers) have been used as rheology modifiers or thickeners because rheological properties of solutions and dispersions are drastically changed by the addition of small amounts of associating polymers. In this lecture, recent development on the molecular origin of the structure formation and rheological properties of associating polymers will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Materials Processing using external fields for microstructure control	1	Properties of materials are not simply determined by atomic structure and chemical composition. Microstructure (crystal grain size, crystallographic orientation and so on) significantly influences the properties. Not a few techniques have been developed for controlling the microstructure. Materials processing using external fields will be demonstrated in this class.(H. Yasuda: Dept. of Materials Science and Engineering)
Force acting on colloidal particles	1	Colloid means small particles dispersed in a liquid solvent. Theoretical approaches on several forces acting on colloidal particles such as thermal, hydrodynamic, and electrostatic forces will be discussed.(R. Yamamoto: Dept. of Chemical Engineering)
Photonic Crystal Technology	1	Photonic crystals are materials with periodic modulation of refractive index, in which a frequency range that existence of photon is prohibited (i.e. photonic band gap) can be formed. In this class, basics and applications of photnic crystals are introduced.(T. Asano: Dept. of Electronic Science and Engineering)
Modern Organic Synthesis for Material Science	1	The lecture will deliver recent developments in organic synthesis, particularly focusing on catalytic reactions that have revolutionized chemical processes, and their applications in the production of some important pharmaceuticals and organic materials.(Y. Nakao: Dept. of Material Chemistry)
Physical Organic Chemistry of Supramolecular Photofunctional Organic Materials	1	This lecture explains interesting behaviors of photofunctional organic materials, such as photochromic compounds and fluorescence dyes, in the aggregated and self-organized state from the viewpoint of physical organic chemistry.(K. Matsuda: Dept. of Synthetic Chemistry and Biological Chemistry)
Introduction to Nuclear Materials	1	Nuclear materials are designed for using in irradiation field of neutron and high-energy particles. Some topics of nuclear transmutation, thermonuclear fusion, boron neutron capture therapy and others will be talked.(I. Takagi: Dept. of Nuclear Engineering)
Directed Self-Assembly (DSA) of Block Copolymers	1	Recently, Directed Self-Assembly (DSA) technology of block copolymers has received a lot of attention in the field of semiconductor research. In this lecture, the fundamentals of microphase separation of block copolymers and the application of DSA to lithographic technologies will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Oxide Magnetic Materials	1	The aim of the lecture is to review the fundamentals and applications of oxide magnetic materials. Main topics include fundamentals of magnetism, magnetic properties of oxides, magneto-optics of oxides, oxides for spintronics, and multiferroic oxides.(K. Tanaka: Dept. of Material Chemistry)
Solar Hydrogen Production using Semiconductor Photocatalyst	1	The development of a clean and renewable energy carrier that does not utilize fossil fuels is a great technological challenge. Photocatalytic water splitting using semiconductor materials has attracted considerable interest due to its potential to cleanly produce H2 from water by utilizing abundant solar light. In the present lecture, the basis and the recent progress in photocatalytic water splitting will be introduced.(R. Abe: Dept. of Energy and Hydrocarbon Chemistry)
Electrodeposition and Electroless Deposition for Materials Processing	1	(1)Fundamentals　chemistry, electrochemistry, and thermodynamics　, and (2)applications of electrodeposition and electroless deposition for materials processing.(K. Murase: Dept. of Materials Science and Engineering)

Textbook　None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information　Check the notice on the bulletin board.

Students who take Spring term (Lecture code 10H012) should attend first 11 lectures.

10K005

Advanced Modern Science and Technology　English lecture
(　　　　)

Code　10K005　Course Year　Master and Doctor Course　Term　　Class day & Period　Thu 5th　Location　A2-306　Credits　2(Semester system)　Restriction　No Restriction

Lecture Form(s)　Relay Lecture　Language　English

Instructor　　　　GL　　　　Edu.　　　　Center,　　　　J.　　　　Assoc.　　　　Prof.,　　　　Ryosuke　　　　Matsumoto
Related professors

Course Description　Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. In addition to the understanding of each technology, the attendances learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development. Group discussions will be done for further understanding of the topics of the course.

Grading　Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site. You can find an attachment file, "　　　　2016　　　　　　　　", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Who shake the dice?	1	Double slit phenomenon known as a prediction inability "quantum mechanics of the mystery (Feynman says)" can be every moment predicted by QED.(A. Tachibana: Dept. of Micro Engineering)
Exploration of Radiation Belts by Space Radio Engineering	1	Radiation belts of energetic particles are formed around magnetized planets such as the Earth, and they have been studied extensively by spacecraft missions and computer simulations for better understanding and utilization of the space plasma environment. We review historical development of space radio engineering and current understanding of radiation belt dynamics.(Y. Omura: Dept. of Electrical Engineering)
Systems Control in Aeronautics and Astronautics	1	Systems control theory is used in several problems in aeronautics and astronautics. This lecture focuses on some of them and further gives an overview of this research based on them.(K. Fujimoto: Dept. of Aeronautics and Astronautics)
Countermeasures of the Contaminated Water at Fukushima Daiichi Nuclear Power Station and that of the Contaminated Soil in Fukushima Area	1	The situation of contaminated water in Fukushima Daiichi Nuclear Power Station and soil contamination in and around Fukushima area and their technological countermeasures taken today will be introduced and discussed.(M. Yoneda: Dept. of Environmental Engineering)
Polymer Synthesis beyond the 21st Century: Precision Polymerizations and Novel Polymeric Materials	1	We are now in the "Polymer Age", where synthetic polymer materials are indispensable in the modern human life: healthy, safe, comfortable, and sustainable. A critical challenge herein is to develop "precision polymerization", polymer-forming reactions that provide polymers of well-defined structures and designed functions. Given these backgrounds, this lecture will overview the following subjects: (a)What polymers are; (b)How to synthesize polymers; (c)How and where polymeric materials work and function; (d)Precision polymer synthesis; and (e)The future of polymeric materials.(M. Sawamoto: Dept. of Polymer Chemistry)
Engineering Approach to Phase Behavior of Fluids Confined in Nanospace	1	Fluids confined in nano-scale pores exhibit peculiar phase behaviors that depends strongly on physico-chemical effects by pore walls and conditions of the bulk phase in equilibrium with the pore fluids, to which the engineering approach must be effective.(M. Miyahara: Dept. of Chemical Engineering)
Elucidation of Principles for the Self-organization of Mesoscale Colloidal Particles	1	The process of so-called the colloid crystal has been pursued to find out the key principles for the structure evolution, employing the Brownian dynamics simulations. Also given in the lecture will be various pattern formations in the convective self-assembly of colloidal suspensions.(M. Miyahara: Dept. of Chemical Engineering)
Architectural Design and Architectural Thinking	1	Architectural design is integration of thinking on architectural events and materials. I would like to discuss this architectural thinking and the method to embody it.(K. Takeyama: Dept. of Architecture and Architectural Engineering)
Genome sequences, what do they say and how can we use them?	1	Owing to the revolutionary advances in DNA sequencing technology, the complete genome sequences of a large number of organisms are now available. Here we will discuss what these genome sequences tell us and how we can use them to further increase our understanding of life.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Vacuum Nanoelectronics Devices in Harsh Environments	1	This lecture reviews the perspective of the modern vacuum electron devices based on miniaturized electron sources fabricated with contemporary semiconductor processes. The performance of the devices is evaluated in view of the device in harsh environments.(Y. Gotoh: Dept. of Electronic Science and Engineering)
Advanced Digital Technology for Analytical Recording of Cultural Heritage Assets	1	(A. Ide: Dept. of Mechanical Engineering and Science)
Protein Structure, Function, and Motion	1	Proteins work by fluctuating and changing their conformations. Protein structures and motions, which are essential for understanding their functions in detail, are introduced in conjunction with the state-of-art methods to analyze them.(K. Sugase: Dept. of Molecular Engineering)
Laser-induced Breakdown Spectroscopy and Its Application to Underwater In-situ Elemental Analysis	1	Development of laser-induced breakdown spectroscopy (LIBS) for in-situ elemental analysis in water, and the application to resource exploration at sea bottom will be explained.(T. Sakka: Dept. of Energy and Hydrocarbon Chemistry)
Micro- and Nano-scale Separations in Analytical Chemistry	1	Micro- and nano-scale high performance separation techniques, including capillary electrophoresis and microchip electrophoresis, will be discussed in terms of both fundamental characteristics and applications.(K. Otsuka: Dept. of Material Chemistry)
Modern Techniques for Material Characterization	1	Overview of modern techniques for material characterization is given with basic principles and practical applications. Impacts on the life of the people of characterization techniques are also included.(J. Matsuo: Dept. of Nuclear Engineering)

Textbook　None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information　Students who take Autumn term should register "Lecture code 10H006".

Human Security Engineering

Code   10X301   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 5th   Location   C1-171

Credits   2   Restriction   Lecture Form(s)   Relay Lecture   Language   English

Instructor   MATSUOKA   Yuzuru,MONNAI   Teruyuki,OHTSU   Hiroyasu,TANAKA   Hiroaki,TATANO Hirokazu,KOBAYASHI Kiyoshi,MATSUSHITA Kazuo,

Course Description   This lecture aims to get student to comprehensively and deeply understand issues related to "Human Security Engineering" as a system of technologies for designing and managing cities that enable inhabitants to live under better public health conditions, and environemntal destruction, as listed in the Millennium Development Goals from the viewpoint of four existing fields, i.e. urban governance, urban infrastructure management, health risk management, and disaster risk management. In addition, we'll provide lectures on this new discipline systematically based on the relationship between four existing fields.

Grading   Participation, Presentation, and Report

Course Goals

Course Topics

Theme	Class number of times	Description
Orientation	1	
Tentative Overview of Human Security Engineering	1	
Urban Governance	2	
Urban Infrastructure Management	2	
Health Risk Management	2	
Disaster Risk Management	2	
Human Security and Environmental Security	1	
Human Right, Property and Social Capital	1	
Poverty Traps	1	
Discussion on Human Security Engineering	1	
Evaluation and Report	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites   http://hse.gcoe.kyoto-u.ac.jp/en/inside/kyomu/index.html

Additional Information

Lectures in Urban Governance 1

Code   10X305   Course Year   Doctor Course   Term   1st term   Class day & Period   Supervisor

Location   Supervisor   Credits   2   Restriction   Lecture Form(s)   Seminar   Language   Instructor

Course Description   This class will cover the hot topics on urban governance within human security engineering. Instructors will present current literature and expect students to develop arguments.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Tailor-made lectures by supervisor

Lectures in Urban Governance 2

Code   10X307   Course Year   Doctor Course   Term   2nd term   Class day & Period   Supervisor

Location   Supervisor   Credits   2   Restriction   Lecture Form(s)   Seminar   Language   Instructor

Course Description   In this class, research topics related to urban governance within human security engineering will be assigned to students to enable them to solve human security problems. The students are required to review the latest or important fundamental papers, including related areas, and debate ideas with their teachers.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Tailor-made lectures by supervisor

10X311

Urban Infrastructure Management

Code   10X311   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 3rd

Location   C1-173   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   OHTSU Hiroyasu,

 Course Description   This lecture aims to provide interdisciplinary knowledge associated with how urban infrastructure is comprehensively management, from viewpoints of not only economy but also "human security engineering". In detail, the contents of lectures consist of following topics: Urban Infrastructure Asset Management, Urban Transport/Logistics Management and Urban Food/Water Supply Management.

 Grading   Attendance(20), Report(80)

 Course Goals   Aquisition of interdisciplinary knowledge associated with how urban infrastructure is comprehensively management, from viewpoint of not only economy but also "human security engineering".

 Course Topics

Theme	Class number of times	Description
Guidance, Introduction of Urban Infrastructure Asset Management	1	Guidance & Introduction to Urban Infrastructure Asset Management
Urban Infrastructure Asset Management	5	Urban Infrastructure Asset Management on Geotechnical structures, Bridge and Pavement
Urban Transport/Logistics Management	4	Urban Transport/Logistics Management
Urban Energy Supply Management	3	Urban Energy Supply Management
Report	1	Report
Feed back	1	Feed back

 Textbook

 Textbook(supplemental)   Hand-out

 Prerequisite(s)

 Independent Study Outside of Class

 Web Sites

 Additional Information

Lectures in Urban Infrastructure Management 1

1

Code   10X315   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X317

Lectures in Urban Infrastructure Management 2

2

Code   10X317   Course Year   Doctor Course   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Lecture on Environmental Management Leader

Code 10X321   Course Year Master and Doctor Course   Term 1st term   Class day & Period Thu 5th   Location C1-171   Credits 2   Restriction

Lecture Form(s) Relay Lecture   Language English   Instructor TANAKA Hiroaki,SHIMIZU Yoshihisa,FUJII Shigeo,

Course Description   In this class, we'll give lectures on theory of risk analysis, risk identification, risk assessment, risk evaluation, and risk reduction and avoidance in the field of urban human security including human health risk and ecological risk. The main purpose of this lecture is to provide students basic viewpoint and knowledge required for environmental leaders who can practically solve environmental issues occurring in developing countries, showing several international environmental projects as practical case works.

Grading   Participation, Oral and Poster Presentation, and Report

Course Goals   The main purpose of this lecture is to provide students with the basic viewpoint and knowledge required for environmental leaders able to practically solve environmental issues occurring in developing countries, focusing on several international environmental projects as practical case works.

Course Topics

Theme	Class number of times	Description
Introduction	1	In this introductory lecture, the current situation and problems of the environment in Asian developing countries are explained, and basic ideas for their improvement measures are given together with fundamental terminologies.
Energy and Environment	1	
View point and commitment to rural environmental issues	1	
Disaster Risk Management and Grass-roots International Cooperation	1	
Environmental Risk Assessment and Risk Communication	1	
Water, Sanitation and Solid Waste Management for Developing Countries	1	
Presentations and Discussions	2	
Japan's Lessens on Economy & Development	1	
Solid Waste Management	1	
Ensuring Sustainability in Water Supply and Sewerage Sector	1	
Water Supply and Human Security	1	
Impending Issues in Lake Biwa-Yodo River Water Management and the Basin Governance	1	
Environment & Sanitary Engineering Research International Session	1	
Poster Presentation in Environment & Sanitary Engineering Research Symposium	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   To be announced at class about poster presentation in Environment & Sanitary Engineering Research Symposium.

10X323

Lectures in Health Risk Management 1

1

Code   10X323   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Lectures in Health Risk Management 2

2

Code   10X325   Course Year   Doctor Course   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

733103

Management of Global Resources and Ecosystems

Code 733103   Course Year Master and Doctor Course   Term 1st term   Class day & Period Fri 2nd

Location   Main Lecture Room, Research Bldg. No.5, Yoshida Campus   Credits 2   Restriction No Restriction   Lecture Form(s) Lecture

Language   English   Instructor   Shinnya Funakawa, Shozo Shibata, Yo Yamashita

Course Description   Considerations of how terrestrial and aquatic ecosystems are structured, work, and respond what is done to and around them. Provides basis for understanding world's ecosystems and assists students in evaluating alternatives and in making wise decisions regarding world's ecology and resource management.

Grading   Evaluated by the sum of scores of mid-term quizzes and reports (50%) and end-of-term report (50%).

Course Goals   At the end of this class, students are required to understand basic ecological processes in terrestrial and aquatic ecosystems as a basis for studying further global environmental issues.

Course Topics

Theme	Class number of times	Description
Large-scale Pattern of Climatic Variation	1	Large-scale Pattern of Climatic Variation Given by Prof. Funakawa
Energy transformation and nutrient cycling in terrestrial ecosystems	1	Energy transformation and nutrient cycling in terrestrial ecosystems Given by Prof. Funakawa
Soil and Soil Ecosystem	1	Soil and Soil Ecosystem Given by Prof. Funakawa
Ecological resources and their utilization under humid climatic conditions	1	Ecological resources and their utilization under humid climatic conditions Given by Prof. Funakawa
Ecological resources and their utilization under arid and semi-arid climatic conditions	1	Ecological resources and their utilization under arid and semi-arid climatic conditions Given by Prof. Funakawa
Forests and forest ecosystem	1	Forests and forest ecosystem Given by Prof. Shibata
Forest environment	1	Forest environment Given by Prof. Shibata
Forest destruction and restoration	1	Forest destruction and restoration Given by Prof. Shibata
Forest and Forestry	1	Forest and Forestry Given by Prof. Shibata
Management of forest resources	1	Management of forest resources Given by Prof. Shibata
Oceanic environments and biological production system	1	Oceanic environments and biological production system Given by Prof. Yamashita
Ecology of aquatic animals	1	Ecology of aquatic animals Given by Prof. Yamashita
Anthropogenic impacts on coastal ecosystem	1	Anthropogenic impacts on coastal ecosystem Given by Prof. Yamashita
Ecosystem and fisheries resources	1	Ecosystem and fisheries resources Given by Prof. Yamashita
Management of fisheries resources	1	Management of fisheries resources Given by Prof. Yamashita

Textbook   Not specified.

Textbook(supplemental)

Prerequisite(s)   Not specified.

Independent Study Outside of Class   Students are required to study on each of the topics after lecture by using the materials distributed.

Web Sites

Additional Information

Environmental Ethics and Environmental Education

Code   733104   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 5th

Location   Main Lecture Room,Research Bldg. No.5, Yoshida Campus   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   English   Instructor   Rajib Shaw, Jane Singer

Course Description   Ethical approaches and educational activities are essential for solving environmental problems, especially to facilitate consensus building among conflicting stakeholders. This course covers prominent schools of thought in the field of environmental ethics, and broader aspects of environmental education, including education for sustainable development, climate change education and disaster risk reduction education. The purpose is to deepen students' theoretical understanding and practical competencies based on case studies, fieldwork and in-class exercises.

Grading   Attendance, proactive participation in class discussion and group exercises, class assignments, campus activities, and group presentations

Course Goals   To realize and deepen understanding on the linkage between the class room learning and practical approaches in the field

Course Topics

Theme	Class number of times	Description
Introduction (Shaw and Singer)	1	Week 1: Overview, introduction and evolution of concepts
Part I: Environmental ethics (Singer)	4	Week 2: Basic ethical concepts Week 3: History of environmental movement Week 4: Animal and food issues Week 5: Ethics of water, agriculture and development
Part II: Environment, disaster and climate change education (Shaw)	3	Week 6: Basics of environmental education Week 7: Basics of disaster risk reduction education Week 8: Basics of climate change education
Part III: Advocating for sustainability on campus and beyond (Gannon and Singer)	3	Week 9: Campus and community sustainability Week10: Skills for sustainability communication and advocacy Week 11:Fieldwork
Ethics of water, agriculture and development	4	Week 12: Group presentaions Week 13: Group preparations Week 14: Group presentations Week 15: Feedback session

Textbook   • Environmental Ethics: An Anthology, A. Light and H. Rolston III, (Blackwell Publishing)

• Ecological Literacy: Educating our Children for a Sustainable World, D.W. Orr, (Sierra Club Books)

• Disaster Education, Rajib Shaw, Koichi Shiwaku, Yukiko Takeuchi, (Emerald Group Publishing)

• Education and Climate Change: Living and Learning in Interesting Times, Fumiyo Kagawa and David Selby, (Routledge)

• Sustainability on Campus: Stories and Strategies for Change (Urban and Industrial Environments), Peggy F. Barlett and Geoffrey W. Chase, (The MIT Press)

• Environmental Communication and the Public Sphere, Robert Cox, (SAGE Publications)

• The Sustainable University: Progress and prospects, Stephen Sterling, (Routledge in Sustainable Development)

Textbook(supplemental)   • ESD Toolkit: Web resources http://www.esdtoolkit.org/resources/web_esd.htm

• Education for Sustainable Development: Challenges, Strategies and Practices in a Globalizing World, Anastasia Nikolopoulou, Taisha Abraham, Farid Mirbagheri, (SAGE Publications)

Prerequisite(s)   Not specified

Independent Study Outside of Class   There is no specific required text. Learning materials will be distributed during orientation and each class.

Web Sites

Additional Information

Disaster Risk Management

Code   10X333   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 4th   Location   C1-171

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English   Instructor   TATANO Hirokazu,YOKOMATSU Muneta,

Course Description   Natural disasters have low frequencies but high impacts. It is very important to make an integrated risk management plan that consists of various countermeasures such as prevention, mitigation, transfer, and preparedness. This class will present economic approaches to natural disaster risk management and designing appropriate countermeasures.

Grading   Evaluate mainly by the presentations in the class as well as end-of-term report, taking active and constructive participation in the class into account.

Course Goals   Students are expected to understand fundamental ways of economic analyses of disaster prevention such as economic valuation of disaster losses, decision making principle under risks, derivation of benefits of risk management.

Course Topics

Theme	Class number of times	Description
Introduction to disaster risk management	1	Introduction and Explanation of Course Outline, The Global Trends of Natural Disasters
1. Decision making theory under uncertainty	1	Bayes' theorem, Expected utility function
Methods of disaster risk management	1	Risk control and risk finance
Economic valuation of catastrophic risk mitigation	1	Cost-Benefit analysis, conventional valuation method, catastrophic risks and economic valuation of disaster mitigation
Risk perception bias, land-use and risk communication	2	Risk perception bias, land-use model, risk communication
Disaster risk finance	2	Recent issues of risk finance market, reinsurance, CAT bond, roles of government, derivatives
Risk curve and risk assessment	1	Fragility curve and risk assessment
General equilibrium analysis under disaster risk	1	General equilibrium model under disaster risk
Macrodynamics under disaster risk	1	GDP, economic growth
Disaster accounting	1	Accounting systems
Exercise and presentation	2	Students' exercise and presentation
Confirmation of the learning achievement degree	1	Confirmation of the learning achievement degree

Textbook   Tatano,H., Takagi,A.(ed.):Economic Analysis of disaster prevention, Keiso pub.,2005 (in Japanese).

Textbook(supplemental)   Froot ,K.A.(ed)“The Financing of Catastrophic Risk”, the University of Chicago Press Kunreuther H. and Rose, A.,“The Economics of Natural Hazards”, Vol.1 & 2, The International Library of Critical Writings in Economics 178, Edward Elgar publishers, 2004

Okuyama, Y., and Chang, S.T.,(eds.)“Modeling Spatial and Economic Impacts of Disasters”(Advances in Spatial Science), Springer, 2004.

Prerequisite(s)   Nothing

Independent Study Outside of Class

Web Sites   No web site

Additional Information

Lectures in Disaster Risk Management 1

1

Code   10X335   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X337

Lectures in Disaster Risk Management 2
2

Code   10X337   Course Year   Doctor Course   Term   2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Internship for Human Security Engineering

Code   10X339   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X341

Advanced Capstone Project

Code   10X341   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   8   Restriction   Lecture Form(s)   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Human Security Engineering Seminar A
A

Code 10X351   Course Year Master Course   Term 1st+2nd term   Class day & Period Up to each supervisor

Location Up to each supervisor   Credits 4   Restriction 5 years type students only   Lecture Form(s) Seminar

Language English   Instructor Relevant teachers,

Course Description   In the style of seminar, each student is given a theme for research related to human security problem to be solved by engineering methods, and the understanding on such a problems will be deepen from a specialized viewpoint of each student. Each student will get individual guidance by the supervisor about the method of the study on the problem or the collection method of the related information. Reports and presentation will be assigned after discussion with the supervisor.

Grading   Grade is evaluated comprehensively by the supervisor.

Course Goals   To master the practical method to approach actual problems related to human security engineering.

Course Topics

Theme	Class number of times	Description
		Tutorial by Seting up of reseach problem, discussion, presentation, etc.

Textbook   Not appointed. Research papers will be given if necessary.

Textbook(supplemental)   It will be introduced any time if necessary.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X352

Human Security Engineering Seminar B

B

Code 10X352   Course Year Master Course   Term 1st+2nd term   Class day & Period Up to each supervisor

Location Up to each supervisor   Credits 4   Restriction 5 years type students only   Lecture Form(s) Seminar

Language   English   Instructor   Relevant teachers,

Course Description   In the style of seminar, each student is given a theme for research related to human security problem to be solved by engineering methods, and the understanding on such a problems will be deepen from a specialized viewpoint of each student. Each student will get individual guidance by the supervisor about the method of the study on the problem or the collection method of the related information. Reports and presentation will be assigned after discussion with the supervisor.

Grading   Grade is evaluated comprehensively by the supervisor.

Course Goals   To master the practical method to approach actual problems related to human security engineering.

Course Topics

Theme	Class number of times	Description
		Tutorial by Seting up of reseach problem, discussion, presentation, etc.

Textbook   Not appointed. Research papers will be given if necessary.

Textbook(supplemental)   It will be introduced any time if necessary.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Infrastructural Structure Engineering

Code 10W001   Course Year Master and Doctor Course   Term 2nd term   Class day & Period Thu 2nd

Location C1-172   Credits 2   Restriction No Restriction   Lecture Form(s) Relay Lecture

Language English   Instructor Related Faculty members,

Course Description   Structural engineering problems related to planning, design, construction and maintenance of the infrastructures are discussed. Topics concerning structural engineering and management are widely taken up including latest advanced knowledge and technology, future view and/or international topics. Special lectures by extramural lecturers are carried out if necessary.

Grading   Coursework will be graded based on the reports.

Course Goals   To grasp problems related to structural engineering and their specific solutions.
To understand applicability of advanced technologies and development prospects.

Course Topics

Theme	Class number of times	Description
Structural Materials, Structural Mechanics	4	Steel materials, Concrete materials, mechanical behavior of structures, Problems related to design, construction and maintenance
Applied Mechanics	1	Numerical analysis for structure performance evaluation
Earthquake and Wind Resistance of Structures	7	Infrastructure and natural disaster, Trends of disaster prevention technology, Problems related to Earthquake and wind resistant design
Maintenance of structure	3	International technology, Scenario design, International technological education and collaboration

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

Textbook(supplemental)   Supplemental text books will be introduced by instructors.

Prerequisite(s)   Structural Mechanics, Wind Resistant Design, Construction Materials, Dynamics of Structures, etc.

Independent Study Outside of Class

Web Sites

Additional Information

Hydraulic Engineering for Infrastructure Development and Management

Code   10F065   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 3rd
Location   C1-117   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English
Instructor   Hosoda Takashi, Toda Keiichi, Gotoh Hitoshi, Tachikawa Yasuto, Kisihida Kiyoshi, Ichikawa Yutaka,
Harada Eiji, Sanjou Michio, Khayyer Abbas and Kim Sunmin,

Course Description   This lecture picks up various water-related problems and provides their explanation and solution methodology related to hydrodynamic and hydrological infrastructure improvements, maintenance, disaster prevention against flood and damage of water environment, interweaving several leading-edge cases in the real world. Turbulent flow and CFD, sediment transport system and design/planning of hydraulic structure are described on the basis of the integrated management of river-and-coast systems with sediment control and these relationship with infrastructure improvement. Perspective from the viewpoint of public environmental infrastructure on water environment is presented.

Grading   Grading is based on students activities in lectures and reports.

Course Goals   Students learn about case-based practical solutions against various problems related to hydraulic engineering, and students acquire academic preparation of how to approach to public environmental infrastructure on water area.

Course Topics

Theme	Class number of times	Description
Introduction	1	The purpose and constitution of the lecture, the method of the scholastic evaluation are explained.
Hydraulics in open-channel flows	3	Several problems and exciting topics related to hydraulics in open-channel flows are discussed with advanced practical examples.
River basin management	3	Introduction of flood disasters during a few decades in the world, flood control planning in Japan, Economic evaluation and analysis of people's awareness to river improvement projects with dam construction.
Beach erosion	3	Several problems and their solution methodology against sediment transport process in coastal zone are explained. Advanced approaches for sediment control are overviewed.
Rainfall-runoff prediction and hydrologic design	3	Water resources issues related to rainfall-runoff prediction and hydrologic design are discussed with advanced practical examples.
Numerical simulation for Hydraulic engineering	1	Recent numerical simulation development and related state-of-the-art technologies are overviewed.
Achievement Confirmation	1	Comprehension check of course contents.The exercises to the given subjects are performed.

Textbook   Non
Textbook(supplemental)   Non
Prerequisite(s)   hydraulics, fluid mechanics, river engineering, coastal engineering, hydrology, etc.
Independent Study Outside of Class
Web Sites   Non
Additional Information   Non

Structural Stability

Code   10F067   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   C1-171   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Hiromichi SHIRATO, Kunitomo SUGIURA,

Course Description   Fundamental concept of static and dynamic stability of large-scale structures such as bridges is to be introduced in addition to the way to keep/improve their safety and to evaluate their performance. Basic concept of structural stability and its application and technical subjects to improve safety will be lectured systematically. Furthermore, the practical solutions to the subjects are to be introduced to assure the safety of structures.

Grading   Grading will be evaluated by written examination, reports and attendance.

Course Goals   The class aims to cultivate the understanding of static and dynamic stability problems for structural system and make understand the methodology to clarify the limit state. To get knowledge on countermeasures to assure the stability which is applicable to practical design and manufacturing will be also required.

Course Topics

Theme	Class number of times	Description
Elastic Stability under Static Loading	7	Stability of Structures and Failures Basis of Structural Stability Elastic Buckling of Columns Elastic Buckling of Beams & Frames Elastic Buckling of Plates Elasto-plastic Buckling Buckling Analysis
Basic theory of dynamic stability and its application	7	The stability around the equilibrium points based on the state equation of motion in which the nonlinearity of external, damping and restring forces are taken into account. Wind-induced vibration of a square prism (Galloping) and 1dof system with nonlinear spring will be introduced as practical examples. Chaotic motion of a pendulum subjected to periodic external force is also explained as an introduction of chaos theory.
Achievement Check	1	Summary and Achievement Check.

Textbook   Not specified.

Textbook(supplemental)   Introduced in class if necessary.

Prerequisite(s)   It is desired for participants to master structural mechanics, continuum mechanics, mathematical analysis as well as vibration theory.

Independent Study Outside of Class

Web Sites   none

Additional Information   none

10F068

Material and Structural System & Management

Code   10F068   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd
Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Relay Lecture
Language   English   Instructor   Hirotaka Kawano,Atsushi Hattori,Takashi Yamamoto,
Course Description   With regard to the maintenance of concrete structures, the deterioration prediction procedures in material and structural properties are discussed based on durability and deterioration processes of concrete structures. Repair materials and methods are also introduced. Note: strengthening materials and methods are discussed in Concrete Structural Engineering, provided in the second semester. In the later half of this lecture, structures are focused as groups rather than an individual structure to understand the difference between asset management and maintenance. By taking into consideration the economic aspect and human resources aspect as well as the physical aspect, the flow of the asset management for structures' groups with view points of the life cycle cost and the budget is provided.

Grading   Reports ,presentations and other activities are inclusively considered.
Course Goals   To understand the maintenance for a single structure and the asset management for structures' group.
Course Topics

Theme	Class number of times	Description
1. Outline of maintenance for concrete structures	1	
2. Deterioration mechanisms of concrete structures and deterioration prediction	4	
3. Repair materials and methods for concrete structures	1	
4. Maintenance and asset management	2	
5. Maintenance for structures' group	2	
6. Management for structures' group	2	
7. Presentations and discussions	3	

Textbook   Not specified. Some materials may be provided.
Textbook(supplemental)   Not specified.
Prerequisite(s)   Basic knowledge on Construction Materials and Concrete Engineering.
Independent Study Outside of Class   Check the handouts. Additional studies will also be instructed.
Web Sites
Additional Information   Positive presence in the lecture is expected by joining discussions for example.

Computational Fluid Dynamics

Code   10F011   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 4th

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Satoru Ushijima, Hitoshi Gotoh, Abbas Khayyer

Course Description   Computational Fluid Dynamics (CFD) is largely developed according to the progress of computer technology in recent years. It is the powerful and effective technique to predict the various fluid phenomena, which show the complicated behaviors due to the non-linearity and other conditions. This course provides the dynamics of fluids and eddies as well as the discretization and numerical techniques, such as finite difference, finite volume and particle methods.

Grading   The grading will be based on homework assignments.

Course Goals   Course goal is to understand the basic theory and numerical techniques for CFD.

Course Topics

Theme	Class number of times	Description
computational method for incompressible fluids	7	The course introduces the MAC algorithm, which is generally used for incompressible Newtonian fluids on the basis of finite difference and finite volume methods (FDM and FVM). The outline of numerical methods is also discussed for parabolic, hyperbolic or elliptic partial differential equations, in terms of the numerical stability and accuracy. Homework will be assigned each week.
Particle method - basic theory and improvements	7	To simulate violent flow with gas-liquid interface which is characterized by fragmentation and coalescence of fluid, particle method shows excellent performance. Firstly, basics of the particle method, namely discretization and algorithm, which is common to SPH(Smoothed Particle Hydrodynamics) and MPS(Moving Particle Semi-implicit) methods, are explained. Particle method is superior in robustness for tracking complicated interface behavior, while it suffers from existence of unphysical fluctuation of pressure. By revisiting the calculation principle of particle method, various improvements have been proposed in recent years. In this lecture, the state-of-the-art of accurate particle method is also described.
Feedback	1	Discuss the contents of all classes and assignments. The details will be introduced in the course.

Textbook   No textbook assigned to the course

Textbook(supplemental)   Recommended books and papers will be introduced in the course.

Prerequisite(s)   Basic knowledge of fluid dynamics, continuum mechanics and computational technique

Independent Study Outside of Class

Web Sites

Additional Information

Earthquake Engineering/Lifeline Engineering

Code   10F261   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 4th

Location   C1-191   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Kiyono,Igarashi,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	1	
	1	
	1	
Principles of seismic design of structures	2	Fundamental thories on dynamic response of nonlinear elastoplastic structural systems and representative seismic design principles
Seismic performance of concrete and steel structures	1	Essentials and current issues related to seismic performance and design of RC and steel structures
Seismic response control and seismic retrofit of structures	1	Idea and current issues on seismic isolation, seismic response control techniques for enhancement of seismic performance of structures, and seismic retrofit and rehabilitation of existing structures
	1	
	2	
	1	
	1	
Achievement evaluation	1	Students' achievements in understanding of the course material are evaluated.

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Applied Hydrology

Code   10F100   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 4th

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Hori(DPRI), Sumi(DPRI), S.Tanaka(DPRI), Takemon(DPRI), K.Tanaka(DPRI), Kantoush(DPRI)

Course Description   Applied and integrated approach to the problems closely related to the water circulation system, such as floods, droughts, water contamination, ecological change, and social change is introduced mainly from the hydrological viewpoint with reference to water quantity, quality, ecological and socio-economic aspects. In the course, several actual water problems are taken up and solving process of each problem which comprises of problem-identification and formulation, impact assessment, countermeasures design and performance evaluation is learned through the lectures' description and also investigation and discussion among the students.

Grading   Grading is based on student activities in lectures, presentation and reports.

Course Goals   To obtain fundamental Knowledge and skills to perform problem definition, survey amd countermeasure design on problems about water use, water hazard mitigation and water environment.

Course Topics

Theme	Class number of times	Description
Water disasters and risk management	2	Risk assessment of water disasters, countermeasures and adaptation design, wataer disasters and human security
Reservoir Systems and Sustainability	2	Reservoir system and its environmental impacts, Sustainable management of reservoir system
Hydrological Frequency Analysis	3	Basic theory and application of Hydrological Frequency Analysis, which is the basis for hydrologic design.
Land Surface Proceses	2	Modelling of land surface processes, Application of land surface model
Hydrological Measurements of Large River Basins	2	Design and management of hydrological measurement system in large river basins
Hydro-eco Systems	2	Ecohydrological management of habitats in river ecosystems, Ecohydrological management of biodiversity in wetland ecosystems
Presentation and Discussion	2	study and exersize for given topics

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

Textbook(supplemental)   None

Prerequisite(s)   Elementary knowledge of hydrology and water resources engineering.

Independent Study Outside of Class   Review work based on handouts and report work for issues given in the classes are required.

Web Sites

Additional Information

Case Studies Harmonizing Disaster Management and Environment Conservation

Code 10F103   Course Year Master and Doctor Course   Term 1st term   Class day & Period Mon 4th   Location C1-191

Credits 2   Restriction No Restriction   Lecture Form(s) Relay Lecture   Language English

Instructor K. TAKARA(DPRI), H. NAKAGAWA(DPRI), E. NAKAKITA(DPRI), H. MASE(DPRI), N. MORI(DPRI), T. SAYAMA(DPRI)

Course Description   Environmental impacts by infrastructure for disaster prevention and mitigation are discussed. Introducing various examples of natural disasters, degradation of the environment, and harmonizing disaster management and environmental conservation in the world, this classroom carries on a dialogue about effective measures for reducing negative environmental impacts and serious disasters.

Grading   Considering both the number of attendances and the score of final test at the end of the semester.

Course Goals   Conservation of the environment and prevention/mitigation of natural disasters, which are very important for human's survivability, often conflict with each other. This course introduces various examples. Students will learn many examples harmonizing these two issues, and shall consider technical and social countermeasures fitting to the regional characteristics.

Course Topics

Theme	Class number of times	Description
Introduction	1	Introduction
Disaster due to heavy rainfall -- utilization of weather radar and global climate change	3	Disaster due to heavy rainfall -- utilization of weather radar and global climate change
Flood disaster prevention and the environment	2	Flood disaster prevention and the environment
River environment and disaster management	3	River environment and disaster management
Hydrological processes and water disaster predictions	2	Hydrological processes and water disaster predictions
Coastal disasters due to tsunamis and storm surges	2	Coastal disasters due to tsunamis and storm surges
Projection of climate and coastal environmental change	2	Projection of climate and coastal environmental change

Textbook   No particular textbook for this course. Necessary documents and literature introduction are provided in the class room from time to time.

Lecture material for "Coastal disasters due to tsunamis and storm surges"

http://urx3.nu/t4sq

http://urx3.nu/t4sA

http://urx3.nu/t4sC

Textbook(supplemental)   Some literature would be introduced by professors.

Prerequisite(s)   No special knowledge and techniques are necessary, but requires reading, writing and discussing in English in the class.

Independent Study Outside of Class   No specific requirement for independent study. Collect information broadly regarding environment and disaster related topics.

Web Sites

Additional Information   Contact Prof. Takara at <takara.kaoru.7v@kyoto-u.ac.jp> if you have any query.

Integrated Disasters and Resources Management in Watersheds

Code 10F106   Course Year Master and Doctor Course   Term 2nd term   Class day & Period Mon 1st

Location Katsura Campus, Ujigawa Open Laboratory, Shirahama Oceanographic Observatory and Hodaka Sedimentation Observatory

Credits 2   Restriction   Lecture Form(s) Lecture and Exercise   Language English

Instructor Masaharu FUJITA(DPRI), Tetsuya HIRAISHI(DPRI), Nozomu YONEYAMA(DPRI), Kenji KAWAIKE(DPRI), Hiroshi TAKEBAYASHI(DPRI), Daizo TSUTSUMI(DPRI), Yasuyuki BABA(DPRI),

Course Description   Mechanism and countermeasures of sediment disasters, flood disasters, urban flood disasters and coastal disasters are explained. An integrated watershed management of these disasters and water/sediment resources is also introduced. This lecture will be open at Katsura Campus, Ujigawa Open Laboratory, Shirahama Oceanographic Observatory and Hodaka Sedimentation Observatory. Students attending this lecture must take one of the intensive experiment/field study courses offered in Ujigawa Open Laboratory and these observatories.

Grading   Presentation, Discussion and Report

Course Goals   Learn an integrated basin management system for natural disasters (sediment disasters, food disasters, coastal disasters, urban flood disasters) mitigation and water/sediment resources utilization considering environmental conservation.

Course Topics

Theme	Class number of times	Description
Introduction	1	Contents of this lecture are explaned.
Urban flood disaster managemnet	2	We review urban floods from the viewpoint of river basins, flood causes, and features, together with the results of recent studies. Based on these studies, we propose comprehensive measures against urban floods, including underground inundations. In addition, we discuss on prediction methods of the tsunami disaster in urban area.
Flood disaster management	2	Prevention / mitigation measures against flood disasters and flood prediction methods are explained as well as examples of recent flood disasters in Japan.
Sediment disaster management	2	Showing the problems on sediment disasters and sediment resources, I explain an integrated sedimnet management system both for sediment disasters and sediment resources.
Coastal disaster management	2	Coastal erosion and tsunami hazard become remarkable in these days in Japanese coast. In a lecture, we discuss on characteristics of such coastal disasters.
Exercise on flood disaster at Ujigawa Open Laboratory (Selective)		Experiment and analysis on debris flows, riverbed variation and flooding at Ujigawa Open Laboratory, Fushimi-ku, Kyoto city.
Exercise on sediment related disaster at Hodaka Sedimentation Observatory (Selective)		The Hodaka Sedimentation Observatory is located at Okuhida region, Gifu Prefecture. In the field exercise, observation methods of rainfall-runoff and sediment movement processes will be explained. Field investigations into several types of erosion control facilities, sediment producing sites, debris flow sites and sediment related disaster sites will be carried out.
Exercise on coastal disaster at Shirahama Oceanographic Observatory (Selective)		The Shirahama Oceanographic Observatory is located in Shirahama, Wakayama Prefecture. In the lecture, the observatory, waves, currents and tide levels monitoring system is demonstrated as well as the observation tower and the observation boat.

Textbook   None

Textbook(supplemental)   None

Prerequisite(s)   Hydraulics, River Engineering, Coastal Engineering, Sediment Transport Hydraulics

Independent Study Outside of Class

Web Sites

Additional Information

10K016

Computational Geotechnics

Code   10K016   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Language   English

Instructor   ,

Course Description   The course provides students with the numerical modeling of soils to predict the behavior such as consolidation and chemical transport in porous media. The course will cover reviews of the constitutive models of geomaterials, and the development of fully coupled finite element formulation for solid-fluid two phase materials. Students are required to develop a finite element code for solving boundary valueproblems. At the end of the term, students are required to give a presentation of the results.

Grading   Presentation and home works

Course Goals   Understanding the numerical modeling of soils to predict the mechanical behavior of prous media, such as, deformation of two-phase mixture and chemical transportation.

Course Topics

Theme	Class number of times	Description
Guidance and Introduction	1	Fundamental concept in continuum mechanics such as deformation, stresses, and motion.
Governing equations for fluid-soid two-phase materials	2	Motion, conservation of mass, balance of linear momeutum for fluid-solid two-phase materials. Constitutive models for soils, including elasticity, plasticity, and visco-plasticity.
Ground water flow and chemical transport	5	Chemical transport in porous media, advective-dispersive chemical transport.
Boundary value problem, FEM programming	5	The virtual work theorem and finite element method for two phase material are described for quasi-static and dynamic problems within the framework of infinitesimal strain theory. Programing code for consolidation analysis is presented.
Presentation	2	Students are required to give a presentation of the results.

Textbook   Handout will be given.

Textbook(supplemental)

Prerequisite(s)   Fundamental geomechanics and numericalmethods

Independent Study Outside of Class

Web Sites

Additional Information

Geo-Risk Management

Code   10F238   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 4th

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Ohtsu

Course Description   This lecture aims to provide interdisciplinary knowledge associated with geo-risk engineering, the topics of risk analysis focusing on geotechnical structures. In detail, the contents of lectures consist of following topics: Introduction to risk analysis, Mathematical background of geo-risk evaluation, Examples of risk evaluation mainly focusing on slopes and Risk management on road slopes.

Grading   Attendance(10%), Report(30%), Examination(60%)

Course Goals

Course Topics

Theme	Class number of times	Description
Guidance	1	Guidance Introduction of Geo-Asset Management
Basic	4	Basics of Risk Analysis (3)
Probability theory	7	Evaluation of Slope Risk
Case Studies in Asian Countries	2	Natural Disasters in Asian Countries
Feed back	1	Feed back

Textbook   Hiroyasu Ohtsu, Project Management, Corona Publishing, 2010. (in Japanese)

Textbook(supplemental)   C. Chapman and S. Ward, Project Risk Management, John Wiley & Sons, 1997.

R. Flanagan and G. Norman, Risk Management and Construction, Blackwell Science

V.M. Malhotra & N.J. Carino, CRC Handbook on Nondestructive Testing of Concrete, CRC Press, 1989.

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Addtional information is available by visiting the following professors. Appointment shall be made in advance by e-mail.

ohtsu.hiroyasu.6n@kyoto-u.ac.jp

Fundamental Geofront Engineering

Code   10F405   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 1st   Location   C1 Jin-Yu Hall
Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English
Instructor   Prof. Mamoru MIMURA, Prof. Makoto KIMURA, Assoc. Prof. Yosuke HIGO
 Course Description   This course deals with near-surface quaternary soft soil deposits that are the most important in the engineering sense.
Physical properties and the mechanical characteristics of partially saturated and fully saturated soils are explained, and then various problems in
terms of disaster prevention and infrastructure construction are discussed.
 Grading   Performance grading will be provided based on quality of assigned reports and presentations, etc.
 Course Goals   The aim of this course is to understand engineering problems and their mechanical background in the following points:
 - Physical properties and mechanical characteristics of quaternary soft soil deposits and relevant engineering problems in terms of disaster
prevention
 - Fundamentals of unsaturated soil mechanics and engineering problems of earth structures in terms of disaster prevention
 - Concepts of innovative underground foundations and structures and engineering problems during construction
 Course Topics

Theme	Class number of times	Description
Outline of the course, introduction to quaternary deposits	1	Introduction to quaternary deposits. Types and mechanisms of geotechnical disasters relevant to quaternary deposits.
Geo-informatic database	1	Geo-informatic database and its application to modelling soft alluvial soils, liquefaction hazard map, etc.
Evaluation of subsurface structure based on GID	1	Scheme to evaluate subsurface structures using Geo-informatic database including boring logs, geophysical exploration, geological structures. Application to Kyoto basin is given.
Evaluation of liquefaction for near-surface sand depoits	1	Evaluation of liquefaction for near-surface sand deposits using Geo-informatic database is explained. Applications to the 1995 Hyogo-ken Nanbu Earthquake and the 2011 Off the Pacific Coast of Tohoku Earthquake are given, through which open questions are discussed.
Problems of soft clay deposits	1	Deformation characteristics and stability of soft clay deposits and their evaluation methods are explained, e.g., effectiveness and limitation of ground improvement, long term settlement problem, and case histories of large scale reclamation.
Concept of innovative underground structures	1	Citizen-participate-type renovation technique for unpaved roads using sandbags.
Concept of innovative underground structures	1	New construction method of embankments using consecutive precast arch culvert.
Concept of innovative underground structures	2	Technical problems of steel pipe sheet pile. Development of consecutive steel pipe sheet pile and its application.
Outline of earth structures, Unsaturated soil mechanics	2	Roles of earth structures as an infrastructure. Unsaturated soil mechanics.
Damage of earth structures caused by rainfall and earthquake	1	Case examples and their mechanisms of the damages of earth structures caused by rainfall and earthquake.
Methods to evaluate and improve stability of earth structures subjected to rainfall and earthquake	1	Design methods of earth structures and their problems are outlined.
Site visit	1	Visit construction site relevant to the issues of this course.
Evaluation and feedback	1	Evaluation of achievement by assigned reports and its feedback are given.

 Textbook   Handout will be distributed.
 Textbook(supplemental)   References are indicated in the handout.
 Prerequisite(s)   Undergraduate courses in geology, geotechnical engineering, and soil mechanics.
 Independent Study Outside of Class
 Web Sites
 Additional Information

Public Finance

Code   10F203   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 4th

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Kobayashi, Matsushima,

Course Description   The concept of public finance will be taught based upon the framework of Macro economics.

Grading   Final Exam: 60-70%
Mid-term Exam and Attendance: 30-40%

Course Goals   Understand the concept of public finance

Course Topics

Theme	Class number of times	Description
Introduction	1	Explain the outline of this course
GDP and 2. Circular flow model of macro economics	2	Explain about the circular flow model of macro economics and the definition of GDP
Input Output Table and General Equilibrium Model	2	Explain about the input-output table and its role on general equilibrium model
IS-LM Model	2	Explain about IS-LM model to analyze both goods market and money market
International Economics	2	Explain about the international account balance and IS-LM model with trade
AD-AS Model	2	Explain about AD-AS model which analyze the mid term
Economic Growth Model	2	Explain about economic growth model in which long term economic growth is analyzed
Summary	1	Summarize classes and check whether students could achieved its goal.
feedback	1	Accept feedback from students

Textbook

Textbook(supplemental)   Dornbusch et al., Macroeconomics 10th edition, Mcgrow-hill, 2008

Prerequisite(s)   Basic Microeconomics

Independent Study Outside of Class

Web Sites   will be notified in the first class.

Additional Information

City Logistics

Code   10F213   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 3rd   Location   C1-172   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   English   Instructor   Eiichi Taniguchi, Ali G. Qureshi

Course Description   The methodologies of city logistics for establishing efficient and environmentally friendly logistics systems in urban areas will be described. Focusing on the truck traffic within road network, the process, models and the evaluation for building urban freight policy will be given. As well logistics systems using recent development of ICT, the effects of e-commerce on freight transport and supply chain management will be discussed.

Grading   Term examination 80%, Report 10% and Quiz 10%

Course Goals   The course goals are fully understanding the methodologies for establishing efficient, environmentally friendly and safe logistics systems in urban areas as well as obtaining the basic knowledge on modelling and evaluating city logistics initiatives.

Course Topics

Theme	Class number of times	Description
Introduction	1	Introduction to issues on urban freight transport is given and the importance of these issues is discussed in conjunction with urban planning.
What is city logistics?		City logistics are presented to totally solve problems on the efficiency of urban freight transport as well as social problems including tranffic congestion, traffic environment, traffic safety and energy. The concepts of city logistics and characteristics and implementation methods are given.
Status quo and issues in freight transport---urban freight transport policy		The status quo and issues on freight transport is presented and urban freight transport policies are discussed for establishing efficient, environmentally friendly logistics systems in urban areas.
ITS and logistics		Logistics systems using ITS (Intelligent Transport Systems) are presented and how to implement city logistics initiatives using ITS is discussed.
Vehicle routing and scheduling	3	Models for optimising the visiting order and allocation of trucks in delivering goods to customers in urban areas are given and solution methodologies and practical applications are discussed. The probabilistic vehicle routing and scheduling problems with the uncertainty of travel times as well as the dynamic vehicle routing and scheduling problems with the real time travel times are also described.
Location of logistics terminals	2	The optimal location models of logistics terminals and the solution methodologies and their application to practical problems are presented. The location routing planning including vehicle routing and scheduling problems are discussed.
Cooperative freight transport systems	1	Cooperative freight transport systems which jointly operate logistics terminals, trucks and information systems are presented. The merits and demerits of cooperative freight transport systems as well as the methods for promoting them are discussed.
Application of ICT and ITS		It is shown that ICT (Information and Communication Technology) and ITS (Intelligent Transport Systems) allow us to collect data, transmit and analyse them relating to city logistics. The importance of ICT and ITS is emphasized.
Supply chain management, third party logistics and intermodal freight transport		Supply chain management, third party logistics and intermodal freight transport is presented and the innovative management systems which are used in modern logistics are discussed.
New freight transport systems		The chategorization, characteristics and significance of new freight transport systems including underground freight transport systems are presented. The possibility of realizing new freight transport systems is discussed based on cost benefit analyses.
transport demand management and e-commerce		The transport demand management, which is important in city logistics is described and the difference is highlighted with the transport demand management for passenger traffic. Effects of e-commerce on urban freight transport are discussed based on recent behaviour change of consumers.
deregulation and evaluating city logistics		The deregulation on freight transport is described and performance indicators for evaluating city logistics initiatives are discussed.

Textbook   1) Taniguchi, E. and T. Nemoto, City logistics---Efficient and environmentally friendly freight transport planning in urban areas, Morikita Publishing, 2001 (In Japanese).

2) Taniguchi, E., R.G. Thompson, T. Yamada and R. van Duin, City Logistics --- Network modelling and Intelligent Transport Systems. Pergamon, Oxford, 2001.

3) Taniguchi, E. and R.G. Thompson (Eds.) Innovations in freight transport, WIT Press, Southampton, 2002.

4) Taniguchi, E. (Eds.) Contemporary new city logistics, Morikita Publishing, 2005 (In Japanese).

5) Taniguchi, E., R.G. Thompson, City Logistics:Mapping the Future CRC Press, 2014.

6) Taniguchi, E.,T.F. Fwa, R.G. Thompson, Urban Transportation and Logistics: Health, Safety, and Security Concerns, CRC Press, 2014.

Textbook(supplemental)   1) Urban logistics planning, In: Urban transport II, Traffic Engineering Series, Japan Society of Traffic Engineers, 2002 (In Japanese).

2) Brewer, A. M., K.J. Button and D.A. Hensher (Eds.) Handbook of logistics and supply chain management, Pergamon, Oxford, 2001.

3) R.G. Kasilingam, Logistics and transportation, Kluwer Academic Publishers, Dordrecht, 1998.

4) OECD, Delivering the Goods---21st Century Challenges to Urban goods Transport, OECD, 2003.

5) Taniguchi, E. and R.G. Thompson (Eds.) Logistics systems for sustainable cities, Elsevier, 2004.

6) Taniguchi, E. and R.G. Thompson (Eds.) Recent advances in city logistics, Elsevier, 2006.

7) Kuse, H., K. Takada and Y. Takahashi, Logistics management in urban areas, Keiso Shobo, 2006.

8) Taniguchi, E. and R.G. Thompson (Eds.) Innovations in city logistics, Nova Science Publisher, 2008.

9) Golden, B., Raghavan, S. and Wasil, E. (Eds.) The vehicle routing problem: Latest advances and new challenges, Springer, 2008.

10) PIARC, Public sector governance on urban freight transport, 2012.

11) Tavasszy, L. and De Jong (Eds.), G. Modelling freight transport, Elsevier, 2014.

12) Ben-Akiva, M., Meersman, H. and Van de Voorde, E. Freight transport modelling, Emerald, 2014.

Prerequisite(s)   Linear programming, optimisation, queueing theory

Independent Study Outside of Class

Web Sites

Additional Information

Risk Management Theory

Code   10F223   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 3rd

Location   C1-173   Credits   2   Restriction   Lecture Form(s)   Lecture and exercise   Language   English

Instructor   Muneta Yokomatsu,

Course Description   The aim of the class is to provide the basic knowledge of risk management methods for various types of risks such as natural disaster, environment and natural resources in urban and rural areas. Students will learn the decision making principle under risks in Economics and asset pricing methods in Financial Engineering as well as have exercises of application on public project problems.

Grading   20% of score is valuated on attendance and discussion in classes, and 80% on reports.

Course Goals   It is targeted to understand 1) representative concepts of risk and risk management process, 2) expected utility theory and 3) foundation of Financial Engineering, and examine 4) public project problems by applying the above knowledge.

Course Topics

Theme	Class number of times	Description
Basic framework of risk management	2	1-1 Representative concept of risk
		1-2 Risk management technologies
Decision making theory under risks	3	2-1 The Bayes' theorem
		2-2 The Expected utility theory
Financial engineering	6	3-1 The Capital Asset Pricing Model
		3-2 Option pricing theory
		3-3 The arbitrage theorem
		3-4 The Black-Scholes formula
Decision making methods for projects	3	4-1 The decision tree analysis
		4-2 The real option approach
Comprehension check	1	5 Comprehension check

Textbook

Textbook(supplemental)   1.Ross, S.M.: An Elementary Introduction To Mathematical Finance, Cambridge University Press, 1999

2.Sullivan W.G.: Engineering Economy, Pearson, 2012

Prerequisite(s)   Fundamental understanding of probability

Independent Study Outside of Class

Web Sites

Additional Information

10K008

Computational Mechanics and Simulation

Code   10K008   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   C1-173   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture and Exercises   Language   English

Instructor   Ishida, Lin, Furukawa, Flores,

Course Description   The process to obtain numerical solutions for various problems in computational mechanics. Discretization and some solving technique for initial/boundary value problems is to be introduced by the FEM. Fundamental concept of boundary element method (BEM) and its applications in the engineering field will be introduced. Statistical mechanics, molecular dynamics, Monte Carlo method and Multiple scale model will be shortly introduced in order to understand the basic theory of molecular dynamics simulation. Their applications to engineering problems are to be also given by showing some up-to-date examples. Theory of the distinct element method (DEM) will be lectured, and its application in the engineering field will also be explained. Study of contaminant migration in subsurface via groundwater flow modelling coupled with advective-dispersive solute transport. The general groundwater flow and chemical transport in porous media are introduced, then the governing equations for advective-dispersive chemical transport, and the analytical solution of the governing equations are explained. This course will be given in English.

Grading   Achievement is evaluated by submitted reports to each topic.

Course Goals

Course Topics

Theme	Class number of times	Description
Finite difference method	3	Explicit-FDM is explained using an example of unsteady motion of a mass point based on Voigt model. In addition, the numerical simulation results are compared to their theoretical solutions and discussed.
Boundary element method and Molecular dynamics simulation	4	Fundamental concept of boundary element method (BEM) and its applications in the engineering field will be introduced. Monte Carlo method and Multiple scale model will be shortly introduced in order to understand the basic theory of molecular dynamics simulation. Their application to engineering problems are to be also given by showing some up-to-date examples.
Distinct element method and its application	4	Theory of the distinct element method (DEM) will be lectured in this item. The DEM is the numerical analysis method for discontinuum. The application of the DEM in the engineering field will also be explained.
Migration of Contaminants in Subsurface	3	Study of contaminant migration in subsurface via groundwater flow modelling coupled with advective-dispersive solute transport. In this section, we will first introduce the general groundwater flow and chemical transport in porous media, then we will learn about the governing equations for advective-dispersive chemical transport, and finally we will define the parameters and find the analytical solution of the governing equations. Some numerical results will be used as examples to understand the process.
Confirmation of the learning achievement degree	1	Confirmation of the learning achievement degree

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Environmental Risk Analysis

Code   10F439   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 4th

Location   C1-192   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Yoneda, Takano, Matsuda, Shimada, Matsui,

Course Description   Paying attention to the environment of children in particular, students themselves study, make presentation, and debate about the environmental risk. Students learn the backgound, the actual situation, and the theory for quantitative risk analysis through practice of investigation and discusion by themselves.

Grading   Grading based on the participation and performance in presentation and discussion.

Course Goals   To understand or master the necessity of environmental risk analysis, its practical examls, framework for solving problems concerning to risk evaluation, technical and basic knowledge for environmental risk analysis, and the way of thinking for risk analysis

Course Topics

Theme	Class number of times	Description
Introduction Framework of risk analysis	2	Introduction of lecture and grading. Framework of risk analysis for children of WHO.
Children and health risk	1	1) Why children 2) Children are not little adults
Children and environmental change	1	3) The paediatric environmental and health history 4) Global change and children
Air pollution	1	5) Outdoor air pollution 6) Indoor air pollution
Lead and pesticide	1	7) Pesticides 8) Lead
Heavy metal	1	9) Mercury 10) Other heavy metals
Various risk	1	11) Noise 12) Water 13) Food safety
Chemicals	1	14) Children and chemicals 15) Persistent Organic Pollutants
Tobacco and natural toxin	1	16) Second-hand tobacco smoke 17) Mycotoxins, plants, fungi and derivates
Occupational risk and radiation	1	18) Injuries 19) Ionizing and non-ionizing radiations 20) Occupational risks
Respiratory diseases and cancer	1	21) Respiratory diseases 22) Childhood cancer
Innume disorders and neural system	1	23) Immune disorders 24) Neurobehavioral and neurodevelopmental disorders
Endocrine system and environmental monitoring	1	25) Endocrine disorders 26) Bio-monitoring and environmental monitoring
evelopmental toxicity and indicators	1	27) Early developmental and environmental origins of disease 28) Indicators

Textbook   Necessary files are supplied.

Textbook(supplemental)   To be introduced if necessary.

Prerequisite(s)   Not necessary in particular.

Independent Study Outside of Class

Web Sites

Additional Information   The contents may be changed according to the progress of lecture.

10F441

Water Quality Engineering

Code   10F441   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   C1-171   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hiroaki TANAKA,Fumitake NISHIMURA,Naoyuki YAMASHITA,Makoto YASOJIMA,Sei-ichiro OKAMOTO

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Water Sanitary Engineering

Code   10F234   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   C1-192   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English/Japanese   Instructor   Sadahiko Itoh, Shinya Echigo, Yasuhiro Asada

Course Description   The ultimate goal of this course is to understand "Sanitary Engineering" quantitatively. Students will learn methods to quantify chemical and microbial risk in drinking water and realize concept and methods of risk management and control.

Grading   Evaluated by assignments.

Course Goals   To quantify chemical and microbial risk in drinking water and to realize methodologies of risk management and control.

Course Topics

Theme	Class number of times	Description
Environmental risk and quantification	1	Introduction and goal of the class. Concept of "Sanitation". Environmental risk and quantification. Safety of drinking water and acceptable risk level.
Risk assessment and control of hazardous chemicals	3	Risk assessment of hazardous chemicals. Drinking water quality standards. Derivation of drinking water quality standards. The benchmark dose method.
Quantitative microbial risk assessment and management	5	Coexistence and competition between human and microbes. Quantitative microbial risk assessment (QMRA). Comparison of the risk assessment and management methods between chemicals and microbes. Disability adjusted life years (DALYs).
Perspectives of water treatment technology	5	Development of advanced water treatment processes. Water supply technology and its prospects. Water reuse and health risk. Access to safe drinking water in developing countries and global burden of disease.
Feedback and summary	1	Feedback of assignments and summary.

Textbook   Class handouts

Textbook(supplemental)   Itoh, S., Echigo, S.: Disinfection By-products in Water, GIHOUDOU SHUPPAN Co., Ltd., 2008 (in Japanese).

Prerequisite(s)   General understanding of water quality and water treatment process

Independent Study Outside of Class

Web Sites   Data for assignments will be at http://www.urban.env.kyoto-u.ac.jp

Additional Information

Systems Approach on Sound Material Cycles Society

Code   10F454   Course Year   Master and Doctor Course   Term   1st term   Class day & Period Mon 3rd   Location   C1-192

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese/English

Instructor   Shinichi Sakai, Yasuhiro Hirai,

Course Description   It has become a major political/ social issue to establish a Sound Material-Cycle Society in order to save the earth resources and energy and to preserve environmental conservation. This course mainly covers the following topics: 1) History, current status, and future prospect of waste issues and establishment of a sound material-cycles society. 2) Basic concepts and current conditions/ challenges of the following items: The Basic Law for Establishing the Material Cycles Society and the Basic Plan for accomplishing it; Containers and Packaging Recycling Law; Home Appliance Recycling Law; End-of-Life Vehicle Recycling Law and others. 3) Basic concept and application of material flow analysis and life cycle assessment; these tools are important to grasp the whole flow of each recycling, resource use, product consumption, recycle and disposal of waste electrical and electronic equipment, for which it is required to take Clean Cycle & Control concepts in relation to chemical substances. Along with above topics, source origin, behavior, and decomposition of persistent organic pollutants, which should be inevitably linked to the realization of a Sound Material-Cycle Society, will also be discussed in the class.

Grading   Evaluation will be done based on the test scores and learning attitude in class.

Course Goals   The goal of this class is to help students understand the systems and technologies for establishing a Sound Material Cycles Society; students learn how to think about material flow analysis and life cycle assessment in order to develop deep understanding of the whole system of material flow (i.e., resource use, product consumption, cycles and disposal of waste).

Course Topics

Theme	Class number of times	Description
The Basic Law for Establishing the Material Cycles Society and the Basic Plan for Material Cycles	1	Lean the frame work and three indices of this basic plan in detail, and examine recent globally developed " 3R Initiative" activities and status of material cycles in Asian countries.
Development of Each Recycling System	3	Learn the following items separately designated as effective measures under The Basic Law for Establishing the Material Cycles Society: 1) Containers and packaging 2) Home Appliance 3) End-of-Life Vehicle 4) Construction Material 5) Food Material
Each Recycling System and Clean, Cycles & Control Concepts	3	Examine application of the following strategic concepts for waste electrical and electronic equipment, end-of-life vehicles, and battery waste. 1) Clean: Avoid the use of hazardous waste and chemical substances. 2) Cycle: Apply cycle concept when use effects are expected but no alternatives are available.
Basic concept and application of material flow and life cycle analyses	5	Lean about basic concept of Material Flow Analysis (MFA) and Life Cycle Assessment (LCA). Examine food waste recycling using these analyses as a case study.
Environmental Transport Model and Behavior of Persistent Organic Pollutants (POPs)	2	Learn basic concept and application of the model. Examine case studies of global mobility of POPs and behavior of PCB on regional and global scales.
Confirmation of Attainment	1	Confirm students' levels of understanding on the course topics, and make sure of the points of MFA, LCA, and systems and techniques for establishing a sound material-cycle society.

Textbook   Not specified. Materials and references will be distributed when needed.

Textbook(supplemental)   Introduced in class when necessary.

Prerequisite(s)   Solid Waste Management

Independent Study Outside of Class

Web Sites

Additional Information

Atmospheric and Global Environmental Engineering, Adv.

Code   10F446   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese/English

Instructor   Gakuji KURATA,

Course Description   The contents of the lecture are as follows. (1) History of Global Warming problem, Radiative forcing, Green house gas emission, Carbon cycle, Mechanism of Climate Change, Mitigation measures, Social and Natural impact of Climate change (2) Mechanism of formation of Photochemical oxidant and Acid rain, Global scale transportation of atmospheric pollutants, Deposition and its impact of air pollutants, control measure of air pollution. Also, students make presentation and discussion on the related papers.

Grading   Points are allocated for the quiz at every lectures, the presentation and discussion, report.

Course Goals

Course Topics

Theme	Class number of times	Description
Guidance, IPCC, Observation of a climate change	1	(Kurata)
Radiative forcing	1	(Kurata)
Greenhouse gas	1	(Kurata)
Carbon cycle and response of climate	1	(Kurata)
Impact of Climate Change	1	(Kurata)
Energy system and mitigation of climate change	1	(Kurata)
Cross-border transportation and the international measure against air pollution	1	(Kurata)
Urban Air pollution	1	(Kurata)
Acid Deposition and its impact	1	(Kurata)
Simulation of advection and diffusion	1	(Kurata)
Simulation of Atmospheric Chemistry	1	(Kurata)
Indoor air pollution and health impact	1	(Kurata)
Practice	2	(Kurata)
Achievement test	1	

Textbook   Handout

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Urban Metabolism Engineering

Code 10A632   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 3rd

Location   C1-172   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English / Japanese   Instructor   Masaki Takaoka,Gakuji Kurata,Kazuyuki Oshita,

Course Description   Much energy and resources are consumed to maintain various activities in urban city. As the result, various environmental loads such as exhaust gas, wastewater and waste generate and should be reduced to levels natural environment can accept .To establish sustainable urban metabolism, concept, elements, control, optimization and management of urban metabolism are explained.

Grading   Small tests and reports are evaluated.

Course Goals   To understand technological measures by learning about current trend and issue of urban metabolism and related engineering principles.

Course Topics

Theme	Class number of times	Description
Introduction	1	Concept of urban metabolism and its system are explained
Elements of urban metabolic system	8	Planning and selection of urban metabolic system, Transportation & collection, Engineering principles on Recycling, Thermal recovery, Engineering principles on flue gas treatment and Landfill management are explained.
Control, optimization and management of urban metabolic system and environmental equipment	3	Fundamentals of control theory, optimization, system identification and simulation of urban metabolic system and environmental equipment
Design of sewage treatment system in urban area	2	Properties and chemical compositions of sewage and sludge. Introduction and developing trend of sewage treatment system. Elemental and heat balance analysis of sedimentation, aeration tank, anaerobic fermentation and incineration.
Feedback and summary	1	Feedback of small tests and summary

Textbook   Recent paper and/or books will be used.

Textbook(supplemental)

Prerequisite(s)   Environmental plant engineering

Independent Study Outside of Class

Web Sites

Additional Information

New Environmental Engineering I, Advanced

I

Code   10F456   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 5th

Location   Reserch Bldg.No.5-Lecture Room(2nd floor)/C1-171   Credits   2   Restriction   No Restriction

Lecture Form(s)   Relay Lecture   Language   English   Instructor   Y. Shimizu (Prof), H. Tanaka (Prof), and S. Fujii (Prof),

Course Description   This course provides various kinds of engineering issues related to the water environment in English, which cover fundamental knowledge, the latest technologies and regional application examples. These lectures, English presentations by students, and discussions enhance English capability and internationality of students.

The course is conducted in simultaneous distance-learning from Kyoto University, or from remote lecture stations in University of Malaya, and Tsinghua University of China. For the distance-learning, a hybrid system is used, which consists of prerecorded lecture VIDEO, VCS (Video conference system) and SS (slide sharing system).

Grading   Evaluated by class attendance, Q&A and presentation.

Course Goals   Each student is requested to give a short presentation in English in the end of the course. The students will understand the present circumstance of environments in the world, and the students may improve their English skill and international senses through these lectures, presentations, and discussions.

Course Topics

Theme	Class number of times	Description
Wastewater Treatment in Japan	1.4	Guidance & Self Introduction of Students & Lecturer on " Wastewater Treatment Plants Case Study in Japan (Fujii)
Ecological Sanitation	1.4	From Ecotoilets to Ecotowns Shimizu)
Wastewater Treatment in China and Nutrient Removal	1.4	Wastewater Treatment Plant: Case Study in China, Biological Nutrient Removal (BNR) (Prof. Wen, Tsinghua University)
Wastewater Reuse	1.3	Wastewater Reuse & Disinfection (Tanaka)
Wastewater Treatment in Malaysia	1.4	History of Water Pollution in Malaysia (Prof. Ghufran, University of Malaya) Case studies of wastewater treatment plants design & operation (Prof. Nuruol, University of Malaya)
Anaerobic Treatment	1.3	Anaerobic Biological Treatment Technologies (Prof. Shaliza, University of Malaya)
Membrane Technology	1.3	Treatment Technologies (Practical & Advanced Technology I): Membrane Technology (MT) (Prof. Huang, Tsinghua University)
Advanced Oxidation Processes	1.3	Advanced Oxidation Processes (Prof. Zhang, Tsinghua University)
Student Presentation	1.4	Student Presentations /Discussions I (all)
Student Presentation	1.4	Student Presentations /Discussions II (all)
Student Presentation	1.4	Student Presentations /Discussions III (all)

Textbook   Class handouts

Textbook(supplemental)   Introduced in the classes

Prerequisite(s)   General understanding of water environmental issues

Independent Study Outside of Class   The students should study the PPT file used in the lectures. Students also need to enough literature review and related prior to their presentation.

Web Sites

Additional Information   PowerPoint slides are main teaching materials in the lectures, and their hard copies are distributed to the students. In addition, a list of technical terms and difficult English words is given to the students with their explanation and Japanese translation.

New Environmental Engineering II, Advanced

II

Code   10F458   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 5th

Location   Reserch Bldg.No.5-Lecture Room(2nd floor)/C1-171   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   English   Instructor   Prof. Shimidzu, Prof. Takaoka, Associate Prof. Kurata, Prof. Fujii,

Course Description   This course provides various kinds of engineering issues related to atmospheric environment and solid wastes management in English, which cover fundamental knowledge, the latest technologies and regional application examples. These lectures, English presentations by students, and discussions enhance English capability and internationality of students. The course is conducted in simultaneous distance-learning from Kyoto University, or from remote lecture stations in University of Malaya, and Tsinghua University. For the distance-learning, a hybrid system is used, which consists of prerecorded lecture VIDEO, VCS (Video conference system) and SS (slide sharing system). The students are requested to give a short presentation in English in the end of the lecture course. This course may improve students' English skill and international senses through these lectures, presentations, and discussions.

Grading   Evaluate by class attendance, Q&A and presentation.

Course Goals

Course Topics

Theme	Class number of times	Description
Global warming and Low carbon society	1.4	Global warming and Low carbon society
Atmospheric diffusion and modeling	1.4	Atmospheric diffusion and modeling (Prof. S Wang, Tsinghua University)
Air Pollution, Its Historical Perspective from Asian Countries (I),China	1.4	Air Pollution, Its Historical Perspective from Asian Countries (I),China (Prof. Hao, Tsinghua University)
Air Pollution, Its Historical Perspective from Asian Countries (II), Malaysia	1.4	Air Pollution, Its Historical Perspective from Asian Countries (II), Malaysia (Prof. Nik, University of Malaya)
Air Pollution, Its Historical Perspective from Asian Countries (III), Japan	1.4	Air Pollution, Its Historical Perspective from Asian Countries (III), Japan (Kurata)
Student Presentations /Discussions I	1.4	Student Presentations /Discussions I (all)
Introduction to Municipal Solid Waste (MSW) Management in Malaysia	1.4	Introduction to Municipal Solid Waste (MSW) Management in Malaysia (Prof. Agamuthu, University of Malaya)
Solid Waste Management, Case Study in China	1.4	Solid Waste Management, Case Study in China (Prof. Wang, Tsinghua University)
Solid Waste Management, Case Study in Japan	1.4	Solid Waste Management, Case Study in Japan (Takaoka
Solid Waste Management, Case Study in Malaysia	1.4	Solid Waste Management, Case Study in Malaysia (Prof. Agamuthu, University of Malaya)
Student Presentations /Discussions II	1	Student Presentations /Discussions II (all)

Textbook   Class handouts

Textbook(supplemental)   Introduce in the lecture classes

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Either of this course or " New Environmental Engineering I, advanced" can be dealt as " Asian Environmental Enigneering". PowerPoint slides are main teaching materials in the lectures, and their hard copies are distributed to the students. In addition, a list of technical terms and difficult English words is given to the students with their explanation and Japanese translation.

Advanced Enivironmental Engineering Lab.

Code　10F470　　Course Year　Master and Doctor Course　　Term　2nd term

Class day & Period　Monday 3,4　　Location　C1-173　　Credits　2　　Restriction　less than 10 students

Lecture Form(s)　Seminar and Exercise　　Language　English / Japanese

Instructor　Sadahiko Itoh,MInoru Yoneda,Masaki Takaoka,Shinya Echigo,Gakuji Kurata,Makoto Yasojima,

Course Description　Analytical methods to characterize environmental samples are learnt through practical training including site visit to other research institute or analytical company. Also, integration of environmental information using GIS is also mastered.

Grading　Attendance at the class　(50%) and report subjects(50%) are evaluated.

Course Goals　To promote your own research by learning each research method with wide vision

Course Topics

Theme	Class number of times	Description
Guidance and Safety Education		The content of subject and safety education for the following experiment are explained.
Quantitative analysis of elements		The principle of multielement analysis is explained and practical training of ICP-AES or ICP-MS machine is conducted.
Qualitative analysis of elements	2	The principle of X-ray based methods is explained and practical training of one or two X-ray based machine is conducted.
Qualitative analysis of organic compounds and bioassey	5	Qualitative analysis of organic compounds such as mass spectrometry, NMR, ESR and IR and bioassey are explained and practical training of GC-MS etc. is conducted.
GIS		The way to use GIS is learnt.
Site visit		Site visit to research institute or analytical company

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Global Survivability Studies

Code 10F113 Course Year Master and Doctor Course Term 1st term Class day & Period Thu 5th

Location Yoshida, Higashi Ichijokan, Shishukan Hall Credits 2 Restriction No Restriction Lecture Form(s) Lecture

Language English Instructor Kaoru Takara, Junji Kiyono, Satoshi Fujii, Takahiro Sayama, Mika Shimizu

Course Description Modern global society is facing risks or social unrests that are caused by huge natural hazards and disasters, man-made disasters and accidents, regional environmental change/degradation including infectious diseases, and food security. Introducing such examples at global and regional scales, this subject lectures how to cope with them at national, local and community levels for making the society sustainable/survivable. Future countermeasures are also discussed under the uncertain circumstances such as climate change, population growth, energy and socio-economic issues.

Grading Attendance to lectures (40%) and Presentation and discussion (60％).

Course Goals The objectives of this class are to have basic knowledge about global issues threatening safety and security of the earth society such as catastrophic natural disasters, man-made disasters and accidents, regional environmental change (including infectious diseases) and food security, and to enhance student's ability to express his/her own ideas and discuss with professors and students from other study areas.

Course Topics

Theme	Class number of times	Description
Introduction of Global Survivability Studies	1	Introduction of Global Survivability Studies.
Earthquake disaster mitigation	1	Discuss on earthquake disaster mitigation focusing on lessons learnt from Tohoku EQ.
Mitigation of earthquake damage to historic structures	1	Discuss on the mitigation of earthquake damage to historic structures.
Why we need GSS?	1	Discuss on why we need Global Survivability Studies (GSS).
Global agendas for sustainable development and resilient societies	1	Discuss on global agendas for sustainable development and resilient societies.
Building national resilience in Japan	1	Discuss on building national resilience based on Japanese experiences.
Globalism as totalitarianism	1	Discuss on globalism as totalitarianism.
Public policy and systems approach for global changes in disaster risks	1	Lecture and group work on public policy and systems approach for global changes in disaster risks.
Disaster risk management and governance for global changes	1	Lecture and group work on disaster risk management and governance for global changes.
Water-related disaster risk management	1	Discuss on water-related disaster risk management: concept and recent experiences.
Water cycle and climate change	1	Discuss on water cycle and climate change.
Presentation by students & discussions	4	Presentation by students related to this lectures and discussions on the presented topics.

Textbook Nothing special.

Textbook(supplemental) Nothing special.

Prerequisite(s) Nothing special.

Independent Study Outside of Class If handouts (teaching materials) are distributed (or downloaded from the website), students should read them prior to the class. They may be distributed at the classroom (or put on the website). Students can make use of them after the class for reviewing lectures and preparing presentation materials and discussion sessions which will be organized in the latter half of the semester.

Web Sites

Additional Information This subject is compulsory for students enrolled in the Inter-Graduate School Program for Sustainable Development and Survivable Societies. Students other than ones in Graduate School of Engineering should submit a registration card for taking this class.

Introduction to Advanced Material Science and Technology English lecture

Code 10K001 Course Year Master and Doctor Course Term First term/Spring term Class day & Period Fri 5th Location A2-306 Credits First term: 2, Spring term: 1.5

Restriction No Restriction Lecture Form(s) Relay Lecture Language English

Instructor GL Edu. Center, J. Assoc. Prof., Ryosuke Matsumoto

Related professors

Course Description The various technologies used in the field of material science serve as bases for so-called "high technologies", and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

Grading Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site for more information. You can find an attachment file, " 2016 ", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Hyperthermophiles and their thermostable biomolecules	1	This lecture will first introduce the diversity and classification of life. It will then focus on hyperthermophiles and their thermostable molecules, such as proteins, nucleic acids and lipids.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Theoretical Design for Organic Light-Emitting Diode Materials	1	Organic light-emitting diodes have multilayer structures consisting of carrier-transporting layers and a light emitting layer. The concepts employed in desining these materials and their examples are discussed.(T. Sato: Dept. of Molecular Engineering)
In Vivo Optical and Photoacoustic Tumor Imaging using Near-infrared Dye-cinjugated Amphiphilic Polymers	1	Optical and photoacoustic imaging methods are one of the most powerful and noninvasive techniques with which to visualize organs as well as tumor tissues. In this lecture,students can learn the basic principles of molecular imaging as well as recent progress in this field.(K. Ohe: Dept. of Energy and Hydrocarbon Chemistry)
Charge Carrier Transport in Conjugated Molecular Materials	1	How can we facilitate effective charge carrier transport pathway in organic conjugated molecular materials? The major topic of the present lecture is the mechanism of charge carrier transport in conjugated molecular materials. After an overview of electronic structure of conjugated molecular materials based on band models, a variety of measurement techniques is introduced to probe charge carrier mobility in the materials, to figure out characteristic behavior of conjugated molecules (and their aggregates) as electric conductive materials.(S. Seki: Dept. of Molecular Engineering)
Rheology Control by Associating Polymers	1	Hydrophobically modified water-soluble polymers (associating polymers) have been used as rheology modifiers or thickeners because rheological properties of solutions and dispersions are drastically changed by the addition of small amounts of associating polymers. In this lecture, recent development on the molecular origin of the structure formation and rheological properties of associating polymers will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Materials Processing using external fields for microstructure control	1	Properties of materials are not simply determined by atomic structure and chemical composition. Microstructure (crystal grain size, crystallographic orientation and so on) significantly influences the properties. Not a few techniques have been developed for controlling the microstructure. Materials processing using external fields will be demonstrated in this class.(H. Yasuda: Dept. of Materials Science and Engineering)
Force acting on colloidal particles	1	Colloid means small particles dispersed in a liquid solvent. Theoretical approaches on several forces acting on colloidal particles such as thermal, hydrodynamic, and electrostatic forces will be discussed.(R. Yamamoto: Dept. of Chemical Engineering)
Photonic Crystal Technology	1	Photonic crystals are materials with periodic modulation of refractive index, in which a frequency range that existence of photon is prohibited (i.e. photonic band gap) can be formed. In this class, basics and applications of photnic crystals are introduced.(T. Asano: Dept. of Electronic Science and Engineering)
Modern Organic Synthesis for Material Science	1	The lecture will deliver recent developments in organic synthesis, particularly focusing on catalytic reactions that have revolutionized chemical processes, and their applications in the production of some important pharmaceuticals and organic materials.(Y. Nakao: Dept. of Material Chemistry)
Physical Organic Chemistry of Supramolecular Photofunctional Organic Materials	1	This lecture explains interesting behaviors of photofunctional organic materials, such as photochromic compounds and fluorescence dyes, in the aggregated and self-organized state from the viewpoint of physical organic chemistry.(K. Matsuda: Dept. of Synthetic Chemistry and Biological Chemistry)
Introduction to Nuclear Materials	1	Nuclear materials are designed for using in irradiation field of neutron and high-energy particles. Some topics of nuclear transmutation, thermonuclear fusion, boron neutron capture therapy and others will be talked.(I. Takagi: Dept. of Nuclear Engineering)
Directed Self-Assembly (DSA) of Block Copolymers	1	Recently, Directed Self-Assembly (DSA) technology of block copolymers has received a lot of attention in the field of semiconductor research. In this lecture, the fundamentals of microphase separation of block copolymers and the application of DSA to lithographic technologies will be reviewed.(T. Koga: Dept. of Polymer Chemistry)
Oxide Magnetic Materials	1	The aim of the lecture is to review the fundamentals and applications of oxide magnetic materials. Main topics include fundamentals of magnetism, magnetic properties of oxides, magneto-optics of oxides, oxides for spintronics, and multiferroic oxides.(K. Tanaka: Dept. of Material Chemistry)
Solar Hydrogen Production using Semiconductor Photocatalyst	1	The development of a clean and renewable energy carrier that does not utilize fossil fuels is a great technological challenge. Photocatalytic water splitting using semiconductor materials has attracted considerable interest due to its potential to cleanly produce H2 from water by utilizing abundant solar light. In the present lecture, the basis and the recent progress in photocatalytic water splitting will be introduced.(R. Abe: Dept. of Energy and Hydrocarbon Chemistry)
Electrodeposition and Electroless Deposition for Materials Processing	1	(1)Fundamentals chemistry, electrochemistry, and thermodynamics , and (2)applications of electrodeposition and electroless deposition for materials processing.(K. Murase: Dept. of Materials Science and Engineering)

Textbook None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information Check the notice on the bulletin board.

Students who take Spring term (Lecture code 10H012) should attend first 11 lectures.

Advanced Modern Science and Technology   English lecture
( )

Code   10K005   Course Year   Master and Doctor Course   Term   Class day & Period   Thu 5th   Location   A2-306   Credits   2(Semester system)   Restriction   No Restriction

Lecture Form(s)   Relay Lecture   Language   English

Instructor   GL   Edu.   Center,   J.   Assoc.   Prof.,   Ryosuke   Matsumoto
Related professors

Course Description   Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. In addition to the understanding of each technology, the attendances learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development. Group discussions will be done for further understanding of the topics of the course.

Grading   Students who choose the academic semester system must meet the requirements for the first 11 lecturers and the latter 4 lecturers separately.

When evaluating your grade, I employ the average score of best four reports for students who chose the modified quarter system, and best five reports for students who chose academic semester system.

Please go to KULASIS Web site. You can find an attachment file, "   2016   ", where the term Credit will tell you the requirement.

Course Goals

Course Topics

Theme	Class number of times	Description
Who shake the dice?	1	Double slit phenomenon known as a prediction inability " quantum mechanics of the mystery (Feynman says)" can be every moment predicted by QED.(A. Tachibana: Dept. of Micro Engineering)
Exploration of Radiation Belts by Space Radio Engineering	1	Radiation belts of energetic particles are formed around magnetized planets such as the Earth, and they have been studied extensively by spacecraft missions and computer simulations for better understanding and utilization of the space plasma environment. We review historical development of space radio engineering and current understanding of radiation belt dynamics.(Y. Omura: Dept. of Electrical Engineering)
Systems Control in Aeronautics and Astronautics	1	Systems control theory is used in several problems in aeronautics and astronautics. This lecture focuses on some of them and further gives an overview of this research based on them.(K. Fujimoto: Dept. of Aeronautics and Astronautics)
Countermeasures of the Contaminated Water at Fukushima Daiichi Nuclear Power Station and that of the Contaminated Soil in Fukushima Area	1	The situation of contaminated water in Fukushima Daiichi Nuclear Power Station and soil contamination in and around Fukushima area and their technological countermeasures taken today will be introduced and discussed.(M. Yoneda: Dept. of Environmental Engineering)
Polymer Synthesis beyond the 21st Century: Precision Polymerizations and Novel Polymeric Materials	1	We are now in the "Polymer Age", where synthetic polymer materials are indispensable in the modern human life: healthy, safe, comfortable, and sustainable. A critical challenge herein is to develop "precision polymerization", polymer-forming reactions that provide polymers of well-defined structures and designed functions. Given these backgrounds, this lecture will overview the following subjects: (a)What polymers are; (b)How to synthesize polymers; (c)How and where polymeric materials work and function; (d)Precision polymer synthesis; and (e)The future of polymeric materials.(M. Sawamoto: Dept. of Polymer Chemistry)
Engineering Approach to Phase Behavior of Fluids Confined in Nanospace	1	Fluids confined in nano-scale pores exhibit peculiar phase behaviors that depends strongly on physico-chemical effects by pore walls and conditions of the bulk phase in equilibrium with the pore fluids, to which the engineering approach must be effective.(M. Miyahara: Dept. of Chemical Engineering)
Elucidation of Principles for the Self-organization of Mesoscale Colloidal Particles	1	The process of so-called the colloid crystal has been pursued to find out the key principles for the structure evolution, employing the Brownian dynamics simulations. Also given in the lecture will be various pattern formations in the convective self-assembly of colloidal suspensions.(M. Miyahara: Dept. of Chemical Engineering)
Architectural Design and Architectural Thinking	1	Architectural design is integration of thinking on architectural events and materials. I would like to discuss this architectural thinking and the method to embody it.(K. Takeyama: Dept. of Architecture and Architectural Engineering)
Genome sequences, what do they say and how can we use them?	1	Owing to the revolutionary advances in DNA sequencing technology, the complete genome sequences of a large number of organisms are now available. Here we will discuss what these genome sequences tell us and how we can use them to further increase our understanding of life.(H. Atomi: Dept. of Synthetic Chemistry and Biological Chemistry)
Vacuum Nanoelectronics Devices in Harsh Environments	1	This lecture reviews the perspective of the modern vacuum electron devices based on miniaturized electron sources fabricated with contemporary semiconductor processes. The performance of the devices is evaluated in view of the device in harsh environments.(Y. Gotoh: Dept. of Electronic Science and Engineering)
Advanced Digital Technology for Analytical Recording of Cultural Heritage Assets	1	(A. Ide: Dept. of Mechanical Engineering and Science)
Protein Structure, Function, and Motion	1	Proteins work by fluctuating and changing their conformations. Protein structures and motions, which are essential for understanding their functions in detail, are introduced in conjunction with the state-of-art methods to analyze them.(K. Sugase: Dept. of Molecular Engineering)
Laser-induced Breakdown Spectroscopy and Its Application to Underwater In-situ Elemental Analysis	1	Development of laser-induced breakdown spectroscopy (LIBS) for in-situ elemental analysis in water, and the application to resource exploration at sea bottom will be explained.(T. Sakka: Dept. of Energy and Hydrocarbon Chemistry)
Micro- and Nano-scale Separations in Analytical Chemistry	1	Micro- and nano-scale high performance separation techniques, including capillary electrophoresis and microchip electrophoresis, will be discussed in terms of both fundamental characteristics and applications.(K. Otsuka: Dept. of Material Chemistry)
Modern Techniques for Material Characterization	1	Overview of modern techniques for material characterization is given with basic principles and practical applications. Impacts on the life of the people of characterization techniques are also included.(J. Matsuo: Dept. of Nuclear Engineering)

Textbook   None

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Students who take Autumn term should register "Lecture code 10H006".

Design Methodology

Code   10X401   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 4th

Location   C3-Lecture Room 4a   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   NAKAKOJI Kumiyo, MIURA Ken, KANKI Kiyoko, MAKI Norio

Course Description   In the 21st century, it is required to reconsider what is a design and what is a design method. The era a simple artifact is requested is over, and we have to create environmental and social systems including various relations such as the relation among artifacts, the relation between artifacts and men & environment, and the relation among human beings. The role of design is to develop "Human Centered Design (HCD)" which creates meaningful experiences through system integration of man-environmental systems. In this lecture, we explore the design methodology as a basic theory of design after 1960's, explaining design problems, design process, design method, design thinking, and design science based on the design studies in various design fields such as craft, product, architecture, city, landscape, environment, community, education, society, mobility, business, and information. Especially to investigate the mechanism of creative design thinking is very important to solve the daily life problems and many difficult problems human kind encounters. Therefore we explain the design semiotics to clarify the mechanism of generating creative designs and to show valuable examples.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	3	
	4	
	3	
	4	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory for Designing Artifacts

Code   10X402   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 5th   Location   C3-Lecture Room 4a   Credits   2

Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English   Instructor   Tetsuo Sawaragi, Kumiyo Nakakoji

Course Description   The activity of design is fundamentally similar across a wide variety of domains. I use artifact in a broad and atypical sense to describe any product of intentional creation, including physical goods, services, information systems, buildings, landscapes, organizations, and societies. The central theme of this lecture is that a unifying framework informs the human activity of design across all domains. Especially, understanding user needs is a key element of problem definition, and that understanding is usually best developed with interactive and immersive methods. In this lecture, a variety of methodologies for participatory systems approach and an idea of user-experience are provided, and its contributions to the design process are discussed.

Grading   Students will be evaluated based on the following criteria, in the order listed. (1) Exercises assigned in class: approx. 20% (2) Final exam: approx. 60% (3) Contributions to classwork (e.g., asking good questions): approx. 20%

Course Goals   This course is aimed at developing the ability to apply methods for identifying problems and interactively analyzing/evaluating systems, based on understanding of the principles of artifact design and on systematic thinking.

Course Topics

Theme	Class number of times	Description
Introduction	1	We will shed light on the concept of artifacts as something to be put on equal footing with natural objects and examine the history of artifacts in terms of how they were viewed in different ages — namely, artifacts as modes of representation in the ancient world, artifacts as necessities for survival in the middle ages, artifacts as forms of convenience in modern times, and artifacts as a means of perpetuation in the current era.
Artifact function and purpose	3	The effects that artifacts have on the outside world — i.e., other things — are " functions." Function is the concept of questioning the existence of an artifact, and design is the formulation of functions for achieving an intended purpose. We will discuss the categorization of artifacts in terms of how the " purpose" of artifacts relates to the context in which they are used, and look at the origins of artifacts from the perspective of semiosis.
Artifact design principles	2	To understand an artifact is to know how its internal structure acts on the outside world to realize its function. Today, cybernetics — which has explored the interaction between the physical world and the world of information — is expanding into a concept that encompasses society as well (second-order cybernetics), and concepts have been put forward for actively rethinking how human cognition and decision-making interact with the outside world (ecological approaches, socially distributed cognition, naturalistic decision-making). We will examine artifact design principles based on theories related human activity at the boundary of these externalities.
Artifact design representation and evaluation	3	Design must fulfill its role of enhancing the quality of life through the creation of not only individual artifacts, but also environments and social systems that encompass groups of artifacts and natural objects. We will discuss the path toward expanding the scope of design from physical objects to environments and social systems that include intangible services, including with regard to problem development/representation methods, how to set purposes of design, how to eliminate the ambiguities and conflicts among various goals, searching for alternative design strategies, design evaluation, and principles and methods of consensus-forming among different stakeholders.
User-centered artifact design	2	The quality of designs is something to be evaluated by the user, and hence there must be collaboration between users and designers/producers. Moreover, complex design challenges cannot be resolved by experts of only one discipline; they must be tackled by pooling the design-related knowledge of different domains. We will discuss the concept of user-centered design, design rationale, and international standards of design processes for achieving design that is grounded in the user's needs/perspective.
Participatory systems approach	2	In order to deal with the design of large-scale, complex artifacts, one must take the approach of systemically structuring problems and basing design on diverse perspectives. We will broadly examine: interactive processes among system designers, users, and computers; methods of structurally modeling problems through repeated dialogue between experts in relative disciplines and computers; and ways of supporting the perceptions, interpretations, and decision-making of designers and users. We will also consider the utility of the participatory systems approach in smooth, effective implementation of system design.
Exercise in participatory systems approach	2	Students will apply the participatory systems approach to a real-world artifact design challenge, and report the results of this exercise.

Textbook   Lecture notes used in class will be distributed as needed. Refer to " Textbook (supplemental)" below.

Textbook(supplemental)   1.   [2007]   ,   , 1(2), 59-65 2. Suh, N.P. [1990] The Principles of Design, Oxford University Press   (
)   −   ,   , 1992. 3.   [1979]   ,   45 (8) 20 − 26, 1979. 4. Vladimir Hubka and W. Ernst Eder [1995] Design Science, Springer 5. Simon,H.[1996] The Sciences of the Artificial Third edition   [1999]   6
. H   A   [1979]   ,   ,   7. Hutchins, Edwin [1995] Cognition in the Wild. MIT Press 8. Klein, G., Orasanu, J., Calderwood, R., and Zsambok, C.E. [1993] Decision Making in Action: Models and Methods. Ablex Publishing Co., Norwood, NJ. 9. D   [1986] The Design of Everyday Things,   ?   [1981]

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   Office hours will be held for one hour before and after each class period (preferably 5th period on Tuesdays, but also 3rd period on Wednesdays). Appointments for other times can be requested by e-mail.

Code 698541 Course Year Master and Doctor Course Term 1st term Class day & Period Tue 5th

Location C3-Lecture Room 4a Credits 2 Restriction No Restriction Lecture Form(s) Lecture

Language Japanese Instructor ,,

Course Description Any valuable information or knowledge does not make sense if it is not transferred effectively among human beings and our society. We need to organize, design and present information in a way that fosters efficient and effective understanding of it. This course lectures information design, interaction design and visual design. Main topics of the course are: information design and information comprehension (sense-making) theory, information credibility, information organization, spatial cognition/cognitive maps/way finding, linguistics and information design, designing user interface & interactions, photo grammar & film grammar, story-telling, and information visualization.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X403

Organization and Community Design

Code　10X403　　Course Year　Master and Doctor Course　　Term　1st term　　Class day & Period　Tue 4th

Location　C3-Lecture Room 4a　　Credits　2　　Restriction　No Restriction　　Lecture Form(s)　Lecture

Language　Japanese　　Instructor　,,

Course Description　Design of social organizations and communities is a critical component of any design. As we design any artifact--material or otherwise, we need to understand how people understand and act upon the artifacts. Social organizations and communities are then understood and redesigned. For this redesign, designers need to participate in the social organization or the community so that the design they produce is part of the organization or community. In this course, students will learn the basic ideas of organizational and community design and then experience the practices in the field. To do some work in the field, many sessions will be held over the weekend. Any students who seek to learn design are encouraged to take this course to acquire the basic literacy for design of any kind.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Code   698542   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 5th

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description   As a methodology of field analysis required to make product designs of products, services and business in the real field, we give some lectures and related exercise which include field research methods (ethnography, surveys method), quantitative analysis methods (various statistical analysis methods) and model building and simulation methods. After learning of the target field selection, setting of the investigation, and determination of the contents of the survey, you carry out the field research work using ethnography, survey methods and so on. At the next step, you learn data analysis methods using field data obtained from the field works. Finally, we hold the design workshop using the results of the actual field works which are obtained from construction of field analysis model, system dynamics, multi-agents simulation and so forth.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	4	
	3	
	4	
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Laboratory of Design Science

698543

Code   698543   Course Year   Term   1st term   Class day & Period   Mon 4th   Location   Credits   2

Restriction   Lecture Form(s)   Lecture   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design of Complex Mechanical Systems

Code   10X411   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 3rd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10G013

Dynamic Systems Control Theory

Code   10G013   Course Year   Master Course   Term   1st term   Class day & Period   Tue 2nd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	5	
	5	
	4	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design and Manufacturing Engineering

Code   10G011   Course Year   Master Course   Term   1st term   Class day & Period   Fri 2nd

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Robotics

Code   10B407   Course Year   Master Course   Term   2nd term   Class day & Period   Mon 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Fumitoshi Matsuno,

Course Description   Understanding of intelligent behaviors of living things is very interesting. And realization of their intelligent motion by a robot is also attractive for mechanical engineering. In this lecture, we consider basic understanding of beautiful human skill "manipulation" on the point of view of dynamics and control. First modeling methodologies for a rigid multibody system and a general dynamic model of a manipulator are provided. Next, a typical nonlinear control law is introduced and some problems for applying the controller are shown. Based on nature of the dynamics of the manipulator, a very simple and robust controller can be derived by designing energy of the system. This lecture provides modeling methodologies and controller design strategies of the rigid multibody system and we analyze a beautiful human skill of the manipulation.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory for Design Systems Engineering

Code   10Q807   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Tetsuo Sawaragi and Hiroaki Nakanishi,

Course Description   The lecture focuses on the human design activity; designing artifacts (things, events and systems) based on human intuitions, and designing human-machine systems in which the relations between human and objects are of importance.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Engineering Ethics and Management of Technology

Code   10G057   Course Year   Master 1st   Term   1st term   Class day & Period   Thu 3rd

Location   Butsurikei-Kousya   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lectures and Exercise

Language   Japanese   Instructor   Sawaragi, Nishiwaki, Tomita, M. Komori, Tsuchiya, Noda, Sato, Iseda,

Course Description   Basic knowledge of Engineering Ethics and Management of Technology needed for future project leaders in companies and society is taught. Students have to make group work after-class hours as well as presentations of wrapping-up the discussions. Engineering ethics is the field of applied ethics and system of moral principles that apply to the practice of engineering. The field examines and sets the obligations by engineers to society, to their clients, and to the profession. Management of Technology is a set of management disciplines that allows organizations to manage their technological fundamentals to create competitive advantage. This course consists of lectures, exercises, discussions and oral presentations under supervision of professional faculties and extramural lecturers.

Grading   Submission of reports and presentations

Course Goals   To cultivate a spirit of self-sufficiency needed for engineers

Course Topics

Theme	Class number of times	Description
Engineering Ethics	9	1. Introduction to Engineering Ethics (EE)
		2. Medical Engineering Ethics
		3. EE by Institution of Professional Engineers, Japan and abroad
		4. Product Safety and Product Liability
		5. Comprehensive Manufacturing and EE (1)
		6. Comprehensive Manufacturing and EE (2)
		7. Group Discussions
		8. History and Philosophy of EE
		9. Presentation on exercise of EE
Management of Technology	5	1. Product Portfolio, Strategy for Competition
		2. Bussiness Domain and MOT for Marketing
		3. Organizational Strategy for Corporates' R & D
		4. Management Theory for R & D
		5. Presentation on exercise of MOT
Summary	1	

Textbook   No textbook

Textbook(supplemental)   Nothing

Prerequisite(s)   Nothing particular

Independent Study Outside of Class

Web Sites   No Web Site

Additional Information   Nothing particular

Optimum System Design Engineering

Code   10G403   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   C3-Lecture Room 3   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Applied Numerical Methods

Code   10G001   Course Year   Master Course   Term   1st term   Class day & Period   Mon 1st

Location   C3-Lecture Room 1   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Toshiyuki Tsuchiya,

Course Description   Numerical techniques, such as the finite element method and numerical control method, are indispensable in mechanical engineering. In this lecture, basics of numerical techniques which are required to study advanced methods for graduated students will be explained. The lecture will cover the error evaluation, linear system solution (Ax=b), eigenvalue analysis, interpolation approximation method, solutions of ordinary differential equation and partial differential equation. The programing exercise is included in this lecture.

Grading   Home works (four home works will be assigned) and examination.

Course Goals   Understandings of mathematical theories and programing implementations of the numerical methods.

Course Topics

Theme	Class number of times	Description
Introduction	1	Introduction of this class
		Numerical representations and errors
		Macro programing using spread sheet applications
Numerical Error, Approximation	1	Matrix
		Norms
		Singular value decomposition
Linear simultaneous equation 1	2	Solution of simultaneous linear equations
		direct method, iteration method
Eigenvalue analysis	2	Eigenvalue problems
Interpolation	1.5	Interpolation and its errors
Numerical integra	1.5	Numerical integration methods
Normal differential equation and numerical integral	2	explicit method, implicit method
		initial value problem, boundary value problem
Partial differential equation	3	Differential expression of partial differential
		Diffusion equation, wave equation
		Poisson equation, Laplace equation
Examination	1	Feedback for homework and examination

Textbook   Lecture note will be given.

Textbook(supplemental)   Golub, G. H. and Loan, C. F. V., Matrix Computations, John Hopkins University Press R.D.Richtmyer and K.W.Morton, Difference Methods for Initial-Value Problems, Second Edition, John Wiley & Sons 1967

Prerequisite(s)   Basic mathematics for undergraduates

Basic macro programing

Independent Study Outside of Class   Problems are based on macro on Microsoft Excel or LibreOffice (OpenOffice).

Web Sites   Lecture notes, home works, and other info will be distributed through PandA:

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

Additional Information   Have a PC with Microsoft Excel with VBA or LibreOffice (https://ja.libreoffice.org/). Apache OpenOffice(http://www.openoffice.org/ja/) wil be also ok.

Advanced Flight Dynamics of Aerospace Vehicle

Code   10C430   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Mon 4th

Location   C3-Lecture Room 3   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Kei Senda, Sinya Aoi

Course Description   Flight Dynamics and Control of Aerospace Vehicles including Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechanics, etc.

Grading   Evaluation depends on marks of examination (80%) and exercises (20%). Both marks should be 60% or better.

Course Goals   To understand analytical mechanics through flight dynamics of aerospace vehicles: Basic items of Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechanics, etc.

Course Topics

Theme	Class number of times	Description
Analytical Mechanics	7	1. Newton equations, 2. Lagrange equations, 3. Hamilton equations
Orbital Mechanics	4	1. Motions in central force field, 2. Conservation law, 3. Orbit transition
Attitude Dynamics and Control	4	1. Kinematics of rotation, 2. Attitude mechanics, 3. Stability analysis of equilibrium points, 4. Attitude Control

Textbook

Textbook(supplemental)   L. D. Landau and E. M. Lifshitz: Mechanics, Volume 1 (Course of Theoretical Physics

Herbert Goldstein: Classical Mechanics
Toda and Nakajima: Introductory course of physics #1, #2, #10, etc. (Iwnami Shoten)

Prerequisite(s)   Foundation of mechanics and mathematics, Flight Dynamics of Aerospace Vehicle (Undergraduate)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to the Design and Implementation of Micro-Systems

Code	10V202	Course Year	Term	Class day & Period	Location	Credits	Restriction

Lecture Form(s)　　　Language　　　Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Mechanical Functional Device Engineering

Code　10G025　　Course Year　Master 1st　　Term　2nd term　　Class day & Period　Wed 3rd

Location　C3-Lecture Room 2　　Credits　2　　Restriction　No Restriction　　Lecture Form(s)　Lecture

Language　Japanese　　Instructor　,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Mechanical Engineering

Code   10K013   Course Year   Master and Doctor Course   Term   2nd term

Class day & Period   Tue 5th and Thu 4th   Location   C3-Lecture Room 5   Credits   2

Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Faculty members from several fields

Course Description   Lectures on recent topics in various fields of mechanical engineering will be given in English. This is mainly for foreing students (MC/DC), but Japanese students are also welcome.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Mechanics	2	Detailed schedule will be annouced later.
Materials	2	
Thermodynamics	2	
Fluid dynamics	2	
Control	2	
Design	2	
Microengineering	2	
Examination/Feedback	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   This class will be given every two years; Not given in 2015.

Design Theory of Man-Environment Systems

Code   10X412   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Kiyoshi TAKEYAMA, Kiyoko KANKI, Akihisa HIRATA

Course Description   We are now strongly required to extend the design object from the artifact environment to man-environment system in the field of architecture, city, environment, and landscape. It is not enough to construct the general theory of design separated from specific design fields, and we have to develop " Man-environment System Design Theory" to organize design objects and design methods, because the feeling and knowledge on design object have a great influence on design process. In this lecture, we explain design theories and design methods from the multiple viewpoints such as architectural and urban planning & design, landscape design, history and design, social system engineering, and environmental engineering. Moreover we will try to illustrate some advanced design projects as case studies, together with the designers.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction -- Overall VIews for Case Studies		
Case Study -1		
Case Study -2	4	
Case Study -3		
Summarizing Discussions		

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X413

Design Theory of Architectural Structure

Code 10X413 Course Year Master 1st Term 1st term Class day & Period Fri 4th Location C2-101

Credits 2 Restriction No Restriction Lecture Form(s) Lecture Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	6	
	2	
	3	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory of Architectural and Environmental Planning

Code   10X414   Course Year   Term   1st term   Class day & Period   Thu 2nd   Location   C2-102

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Teruyuki Monnai,

 Course Description   Living environment including architectural and urban space is generated by means of the dynamic interaction between man and environment. We are able to find multi-layered complex relations such as function, performance, meaning and value, changing with the time. The role of design is to read various networks of relations, and to develop them to human living environment. The objectives of this lecture are as follows; 1) to read the principles of multi-layered man-environment relations based on "semiotics", "design methodology", and "system theory", 2) to explore the possibility to design comfortable environments and fascinating landscapes based on those principles of man-environment system.

 Grading

 Course Goals

 Course Topics

Theme	Class number of times	Description
Introduction	1	
Basic Theory of Semiotics	4	
Architectural and Urban Semiotics	2	
Development of Townscape Semiotics	2	
Creative Regeneration of Townscape in Historical City Kyoto	1	
System Theory of Designa and Evaluation of Living Environment	1	
Development of Design Methodology	2	
Perspactive on Theory of Architectural and Environmental Planning	1	
Confirmation of the Learning Degree	1	

 Textbook

 Textbook(supplemental)

 Prerequisite(s)

 Independent Study Outside of Class

 Web Sites

 Additional Information

10B035

Design Theory of Architecture and Human Environment

Code   10B035   Course Year   Master Course   Term   1st term   Class day & Period   Tue 2nd

Location   C2-101   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   KANKI Kiyoko,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	6	
	2	
	5	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory of Architecture and Environment Design, Adv.

Code   10B024   Course Year   Master Course   Term   2nd term   Class day & Period   Wed 2nd

Location   C2-213   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Waro Kishu, Takahiro Taji,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	3	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory of Architectural Design, Adv.

Code   10B013   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 4th

Location   C2-213   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	2	
	2	
	2	
	5	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design Mechanics for Building Structures

Code 10B037   Course Year Master Course   Term 1st term   Class day & Period Mon 1st   Location C2-101   Credits 2

Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese   Instructor I. Takewaki, M. Tsuji,

Course Description   Basic mechanics and inverse problem for design of building structures are explained. Structural optimization methods are also presented. Rational structural design approaches are introduced in place of conventional try-and-error approaches.

Grading   Grading is based on the examination at the end of semester.

Course Goals   Obtain the knowledge on basic mechanics for design of building structures. Also obtain advanced knowledges on new theories and methodologies of structural optimization and inverse-problem formulations.

Course Topics

Theme	Class number of times	Description
Fundamentals of mathematical programming	2	Fundamentals of mathematical programming methods are explained. Linear and nonlinear programming methods are introduced and some examples are presented.
Design sensitivity analysis	1	Basic methods of sensitivity analysis for computing derivatives (sensitivity coefficients) of static responses and frequencies of free vibration with respect to variations of design parameters, shape sensitivity analysis with respect to nodal
Application to optimization of framed structures	1	Application of mathematical programming methods to optimization of framed structures is presented.
Earthquake response constrained design	1	Design earthquakes defined in response spectrum and earthquake response constrained design for shear building models
Earthquake response constrained design for response controlled	1	Earthquake response constrained design for response controlled structures and isolated structures including the design of control devices.
Application of optimum design to practical building	1	
Concept of inverse problem	1	Examples of inverse problem in terms of shear building models
Hybrid inverse problem of structural systems	1	Examples of hybrid inverse problem in vibration and classification of hybrid inverse problems. The solution procedure of hybrid inverse mode problems is discussed.
Strain-controlled design method for moment-resisting frames		Simple examples are used for understanding fundamental concepts of strain-controlled design.
Inverse problem via design sensitivity analysis		An inverse problem formulation via design sensitivity analysis (direct method) is explained.
Earthquake-response constrained design		A method of earthquake-response constrained design for shear building models is explained. Design loads in terms of the design response spectrum are used in the design method.
Performance-based Design		A design methodology based on the concept of performance-based design is explained.
Exercise 2		Exercise on inverse problems.
Confirmation of the Learning Degree	1	

Textbook

Textbook(supplemental)   Design Mechanics and Control Dynamics of Building, Architectural Institute of Japan, 1994.

Prerequisite(s)   Mechanics of Building Structures, Basic Linear Algebra, Basic Calculus

Independent Study Outside of Class

Web Sites

Additional Information

High Performance Structural Systems Engineering

Code   10B231   Course Year   Master Course   Term   2nd term   Class day & Period   Wed 2nd

Location   C2-313   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Keiichiro Suita,Yuji Koetaka,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	6	
	7	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Dynamic Response of Building Structures

Code   10B046   Course Year   Master Course   Term   1st term   Class day & Period   Wed 1st

Location   C2-102   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Y.HAYASHI, Y.Ohnishi, K.Nishijima

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	4	
	4	
	2	
	5	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Urban Disaster Mitigation Engineering

Code   10B241   Course Year   Master Course   Term   2nd term   Class day & Period   Tue 3rd

Location   C2-313   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hiroshi Kawase,Shinichi Matsushima

Course Description   The natural disaster to urban society is getting complex and difficult to predict along with the density growth and high performance build-up, and so the risk of the disaster has risen more and more in recent years. Therefore, the necessity of the integrated disaster mitigation measures before the disaster, immediately after the disaster, and long after the disaster is pointed out. In this lecture, we provide the lessens learned from earthquake disaster in the past, prediction methods of strong motions and building damages, earthquake-proof performance evaluation technique in a real building, and a pros and cons of the present building code for the disaster mitigation.

Grading   Grading will be based on the attendance and report.

Course Goals   Understand the seismic vulnerability evaluation of structures and urban systems, the disaster impact evaluation scheme, and the disaster prevention countermeasures. Then learn basic knowledge needed to foresee and prepare for the earthquake disaster in future by themselves.

Course Topics

Theme	Class number of times	Description
Mechanism of disasters by earthquakes	4	What is urban disaster management? Mechanism of disasters by earthquakes, source mechanisms for disastrous earthquakes in and around Japan, ground motion generation process, seismic intensity and magnitude, characteristics of observed ground motion will be explained from previous earthquake disasters.
Basics of wave propagation and strong ground motion	3	Wave propagation analysis and strong motion simulation
Structural response estimation	3	Modeling of structures and prediction of their responses
Environmental impact by great eartuquake disaster	3	Predictions of great earthquake disaster and its environmental impact
Seismic design and retrofit	2	Problems associated with the current building code and retrofitting technology

Textbook

Textbook(supplemental)   Earthquake Ground Motion and Strong Motion Prediction - Key items for learning the basics - (AIJ)

Ground motion - phenomena and theory (AIJ)

Vibration of Architecture (Asakura Publishing)

Prerequisite(s)   Basic knowledge of seismic design and earthquake resistant structure

Independent Study Outside of Class

Web Sites

Additional Information

Environmental Control Engineering, Adv.

Code   10B222   Course Year   Master Course   Term   1st term   Class day & Period   Tue 3rd

Location   C2-102   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Kazunori HARADA,Yoshiaki UETANI

Course Description   This lecture deals with functional aspects of building envelope as a shelter from outdoor climate. Lecture will be given on specified topic on principles of thermal and moisture insulation, control strategy of indoor environment, the prediction methods of air flow, thermal radiation and indoor air quality. Examples will be shown for use in building design for thermal environment control and safety problems during fire.

Grading   Score is evaluated by end-term examination.

Course Goals   To acquire basic concepts on fundamental concepts on thermal environment control for preparation of master thesis development.

Course Topics

Theme	Class number of times	Description
introduction	1	The history of numerical methods in architectural environmental control is briefly introduced, followed by introduction of mathematical formulation of physical phenomena.
numerical methods in heat conduction	4	As a common knowledge, heat conduction equation is dealt with in order to understand the basic framework in numerical methods. At the end of this term, report will be obligatory to understand the meaning of discrete equations and their nature.
numerical methods on fluid motion	5	Lecture will be given for standard methods of calculation of fluid dynamics. At the end of this term, simple practice on control volume method and SIMPLE algorithm will be obligatory.
simultaneous system and turbulence	4	Lecture will be given for simultaneous systems of fluid motion and thermal field. In a similar way, turbulence model is to be introduced. The participants are expected to have learned on environmental engineering in architecture at bachelor level.
Evaluation of archivements	1	Evaluation of archivements will be conducted.

Textbook   None specified.

Textbook(supplemental)   To be specified during the course.

Prerequisite(s)   The participants are expected to have learned on environmental engineering in architecture at bachelor level.

Independent Study Outside of Class

Web Sites

Additional Information

693689

Design in ICT

Code   693689   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 5th   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,

Course Description   Computers and communication networks are representative complex technical artifacts, but it is not an easy task to perceive their construction principles because their design processes are invisible for us. In this course, we study design principles for information and computer technology (ICT) in terms of (1) hierarchical abstraction, (2) tradeoff, and (3) human and social analogy, being the computers and the communication networks as specific examples. Recent advances and directions for the design of future ICT will be also discussed using the above design principles.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	7	
6		
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Industrial mathematics and design

Code   693547   Course Year   Doctor Course   Term   2nd term   Class day & Period   Tue 1st   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,,,

Course Description   Methodologies of mathematical modeling, statistical data analysis, and mathematical optimization are discussed as mathematical common languages supporting inter-disciplinary viewpoints and design thinking for resolving complex problems in today's societies. Various concepts in industrial mathematics used in modeling objects are reviewed to develop high-angle viewpoints for modeling, and data analysis and optimization are lectured as systematic problem-solving methodologies utilizing mathematical modeling. Tools and solvers useful for dealing with practical problems are also reviewed.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Pattern Recognition, Adv.

Code   693164   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English   Instructor   ,,,,,

Course Description   We first explain fundamentals of pattern recognition, clustering methods with several distance measures, and discriminant functions with their learning methods. We then introduce advanced classifiers such as HMM, SVM and CRF and also related topics of machine learning theory, which includes EM learning, the MDL criteria, and Bayesian learning.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Language Information Processing, Adv.

Code   693125   Course Year   Doctor Course   Term   1st term   Class day & Period   Mon 3rd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English   Instructor   ,,

Course Description   This lecture focuses on morphological analysis, syntactic analysis, semantic analysis, and context analysis, including machine learning approaches, which are necessary to process natural language texts. We also explain their applications such as information retrieval and machine translation.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to Algorithms and Informatics

Code   10X431   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English   Instructor   ,

Course Description   This is an introductory course on algorithms and informatics for students with no prior knowledge of the subject matter. The course content will include a look at the early history of algorithms, how computers store data (image, sound, and video), privacy and security issues, web design and algorithms, algorithms for optimization, data mining, and machine learning. Along the way, we will consider a broad variety of algorithms which have had a major impact on computing, including many of the celebrated "Top 10 Algorithms of the 20th Century," chosen by the editors of Computers in Science and Engineering.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Transmission Media Engineering, Adv.

Code   693625   Course Year   Doctor Course   Term   1st term   Class day & Period   Mon 3rd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,

Course Description   This course introduces the following: (1) the technical foundations of wireless and wired transmission technologies such as synchronization; (2) communications link analysis; (3) multiple access and medium access control schemes; and (4) radio resource management based on optimization and game theory.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	2	
	2	
	5	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Code   698035   Course Year   Doctor Course   Term   2nd term   Class day & Period   Wed 5th   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,,,

Course Description   Because of the recent progress in a computer or the maintenance of intelligence infrastructure technology, the increase of the quantity of the data generated from the social activity performed through the Internet such as cloud computing and the quantity of the data obtained through the computer simulation which is an important technique of computational science, is being enhanced every day. It is the purpose of this course to study the technique for analyzing and visualizing those big data. In particular, the data analysis to the large sparse matrix is exercised using the C language.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	
	3	
	3	
	7	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Supercomputing, Advanced

Code 693541 Course Year Doctor Course Term 2nd term Class day & Period Tue 5th Location

Credits 2 Restriction Lecture Form(s) Lecture Language Japanese Instructor ,,

Course Description This lecture is for learning architectural and software issues in supercomputing focusing on parallel high-performance scientific computing. The students will use the supercomputer in ACCMS to learn how a real supercomputer works. The lecture is open to students from any graduate schools whose convenience to attend the lecture is regarded by assigning the fifth period for the lecture.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Optimization Theory, Advanced

Code   693422   Course Year   Doctor Course   Term   1st term   Class day & Period   Thu 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description   Lecture on basic optimization theory and algorithm design for solving mathematical programming problems. Topics include duality in nonlinear optimization, interior point methods for linear and convex programming problems, convex optimization approaches to real-world problems.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	3	
	6	
	4	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Conversational informatics

Conversational informatics

Code 693168   Course Year Doctor Course   Term 2nd term   Class day & Period Wed 2nd   Location

Credits 2   Restriction   Lecture Form(s) Lecture   Language English   Instructor ,,,

Course Description   Conversational interaction is considered to be a powerful communication means for intelligent actors, either natural or artificial, to interact each other to act as a collective intelligence. In this course, we study the mechanism of conversational interactions with verbal and nonverbal cues from computational points of view and discuss key issues in designing conversational systems that can interact with people in a conversational fashion.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

693419

Control Systems Theory, Advanced

Code   693419   Course Year   Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   Integrated Research Bldg.-213   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor

Course Description   This course introduces fundamental ideas regarding robust control theory and explores control system design methods, with system model uncertainty taken into account. The course also discusses the importance of system model uncertainty based on frequency-domain and state-space methods. Topics covered include robust stability conditions and feedback system design that achieves robustness.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Statistical Systems Theory

Code 693536 Course Year Doctor Course Term 1st term Class day & Period Wed 2nd

Location Integrated Research Bldg.-111 Credits 2 Restriction Lecture Form(s) Lecture

Language Japanese Instructor

Course Description Introduction to stochastic and statistical models, which appear in various physical/engineering systems. Topics include model selection, statistical signal processing, Kalman filter, application of stochastic analysis, and related matters.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	3	
	2	
	2	
	6	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Theory of Symbiotic Systems

Code   693518   Course Year   Doctor Course   Term   2nd term   Class day & Period   Mon 4th

Location   Integrated Research Bldg.-213   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,,,

Course Description   Various theories on developing and maintaining harmonious symbiosis among humans, artifacts, and environments are lectured and discussed. Topics include typical forms of harmonious coexistence such as in ecological systems, caring and artistic nature of communication and interactions, philosophical discussions on deep-ecology, and methodologies for designing symbiotic systems.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Social Informatics

Code   693247   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,,,,,,

Course Description   This course introduces social issues dealing with the impact of information technology on society: information policy, information and law, information and economics, information ethics, and information and education. Students will learn the social aspects of information technology from multi-disciplinary viewpoints: the history and trends of information technology; problematic issues regarding an information society; social revolution brought on by information technology, privacy, and security issues; policies concerning information, intellectual properties, and the way IT experts think and the responsibilities they bear.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	3	
	3	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

698014

Information and Intellectual Property

Code   698014   Course Year   Doctor Course   Term   2nd term   Class day & Period   Thu 5th

Location   Engineering Science Depts Bldg.-315   Credits   2   Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor

Course Description   This course introduces the copy right law and copy rights of digital contents, the patent law and patents related to IT area (software patent, business model patent etc.), information technology for management and creation of intellectual properties, the law for the protection of computer-processed personal data held by administrative organs, information ethics and information security. Students are required to acquire the fundamental knowledge of the copy right law, the patent law, information technology for management and creation of intellectual properties, the law for the protection of computer-processed personal data held by administrative organs, information ethics and information security.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Information Network

Code   693628   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,,

Course Description   This course introduces architecture of information networks including communication protocol and layered structure.   Various networks and their technologies, such as circuit switching network, IP network, photonic network, and mobile network, are explained.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	2	
	5	
	3	
	1	
	1	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information   http://www.i.kyoto-u.ac.jp/curriculum/syllabus.html

10X433

Information Systems Design

Code   10X433   Course Year   Doctor Course   Term   1st term   Class day & Period   Thu 3rd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,,,,,

Course Description   This course introduces fundamental concepts, methodologies and underlying technologies for analyzing, designing and implementing social information systems. In particular, the course presents fundamental concepts regarding object-oriented computing, object-oriented design and analysis methodology, database design, user interface design, and design and practice of Web-based information systems including databases. Students will examine design methodology and implementation/operation technologies to learn how information systems are designed, implemented and operated. In conjunction with lectures, students will complete exercises on information system design so that they may understand the theory and technology by applying them to real information system design.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	4	
	3	
	4	
	4	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Designs for Emergency Management

Code   10X434   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 1st

Location   Integrated Research Bldg.-213   Credits   2   Restriction   Lecture Form(s)   Lecture   Language

Instructor   ,,,

Course Description   Damage from disasters is defined by two factors: scale of hazard and social vulnerability. Two strategies exist to reduce damage from disasters - namely, crisis management as a post-event countermeasure and risk management as a pre-event measure. This course introduces students to a system for effective emergency management, consisting of response, recovery, mitigation, and preparedness.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Computational Learning Theory

Code   10X436   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Statistical Learning Theory

Code	10X438	Course Year	Term	Class day & Period	Location	Credits	Restriction

Lecture Form(s)　　　Language　　　Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Information Organization and Retrieval

Code 10X440 Course Year Term Class day & Period Location Credits Restriction

Lecture Form(s) Language Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Distributed Information Systems

Code	10X442	Course Year		Term		Class day & Period		Location		Credits		Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

693254

Code   693254   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design Ethnography

Code 10X451   Course Year Doctor Course   Term 2nd term   Class day & Period Mon 4th   Location

Credits 2   Restriction   Lecture Form(s) Lecture   Language Japanese   Instructor ,

Course Description   Ethnography is seen as one of the key methods for design. At minimum, designers need to understand the field in which they are to introduce their designs. For this, it is not enough to ask people; it is necessary to gain a first-hand understanding through experiencing the lives in the field. Through ethnography, designers can grasp taken-for-granted experiences and start to look at their problems from a fresh perspective. In this course, students will learn the basics of ethnography (e.g., how to write fieldnotes, how to make observations and how to analyze the data) and develop their skills through group projects. This course focuses on the ethnography part of design although in reality it cannot be separated from the rest of the design. Students are encouraged to take other courses on design so that they can fully exploit the insights gained through ethnography.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Business Design

Code   10X452   Course Year   Doctor Course   Term   2nd term   Class day & Period   Mon 3rd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description   This course is a practical business-design workshop in a leading Graduate School of Design. We learn business plan generation such as new business planning, evaluation and improvement on an existing business, and developing new innovative idea for an existing business. In this course, we learn the business planning framework " Business Model Canvas" in a book Business Model Generation. And using this framework we learn wide variation of business components and adjustment of them so as to form a whole system. We will be able to plan a comprehensive and consistent business. Therefore, this class consists of lecture on business components, mini group discussion, group work and presentation to analyze of an existing business model and to plan a reform plan base on " Business Model Canvas."

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design Management

Code   10X453   Course Year   Doctor Course   Term   2nd term   Class day & Period   Mon 5th   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description   Nowadays, "design" has become more and more important factor in business field. In this course, we discuss the various aspects of design in the business context, which are design strategies, marketing, customer experience, creative organizations and service design as well as a definition of a design. Furthermore, students learn ways of thinking such as "functional approach" and "design thinking." In addition, "designer's elaboration" is also learned. This course is planned for students who want to obtain a broad perspective of relationship between design and management.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X454

Magaging Innovation: From R&D towards New Business Development

Code   10X454   Course Year   Doctor Course   Term   2nd term   Class day & Period   Fri 3rd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,

Course Description   Innovation management is increasingly important for enterprises to sustain their businesses. However, it would not be easy, in particular, for Japanese enterprises to conduct innovation management with an entrepreneur mindset. In order to learn innovation management with entrepreneurship, we will focus on the innovation process from R&D towards composing strategies for new business development in this course. Over the semester, we will learn key innovation management aspects, e.g., finding business opportunities, making business models, figuring finance models, analyzing existing business with SEC annual reports, and designing value creation processes. The course consists of lectures, case analyses, special lectures given out by visiting experts, and student presentations based on the knowledge that they gained throughout this course. Those who wish to work for global businesses, business development for high-tech industries, start-ups, service design management, etc., are welcome to enroll.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Service Innovation Management

Code   10X455   Course Year   Doctor Course   Term   2nd term   Class day & Period   Fri 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description   Designing value creation from the viewpoint of service dominant logic is increasingly important for any business. The purpose of this course is to educate students to become a part of the Service Creative Class, where they acquire the capabilities of deeply understanding human behaviors, extracting the vital economic and social values through the combined knowledge of the natural and social sciences. In order to pursue such design capabilities, various kinds of interdisciplinary knowledge are required. In this course, we will focus on key service innovation management. The components that are included in this course are; service marketing, human resource management, service strategies, service accounting service hospitality, IT service management, and applications to several vertical domains as public services or professional services. The course is provided by a series of omnibus style lectures. Those who wish to work for global businesses, business development for high-tech industries, start-ups, service design management, etc. in the context of knowledge and servicizing economy, are welcome to enroll.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Marketing Research

Code   10X456   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description   This course (Marketing Research) is designed to give an overview or process of marketing in order to identify and solve marketing problems. It focuses not only on giving fundamental knowledge but also on applying its knowledge to marketing problems. It should be practical.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Cognitive Theory of Design

Code   10X461   Course Year   Doctor Course   Term   1st term   Class day & Period   Thu 1st   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,,,,,

Course Description   Cognitive psychology posits that the human activities involved in the design process can be grasped by examining the brain, mind, and behavior. The objective of this course is to encourage comprehensive discussions of design based on cognitive psychology theory. First, we will gain a better understanding of how the brain, the mind, and behavior are designed. Second, we will discuss their respective constraints and explore the relationships that exist between those constraints and the rich cognitive activity that results when we turn constraints into advantages. Third, we will examine examples drawn from literature, art, and music that will serve as the basis for discussions about the relationships that exist among the functions of the brain, the mind, and behavior. We will also examine the rich designs each function can produce. Finally, to improve students' abilities to produce rich designs, we will discuss various environmental factors to encourage the development and activation of our own brains, minds, and behaviors.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X462

Seminar on Psychology and Design Studies

Code   10X462   Course Year   Doctor Course   Term   1st term   Class day & Period   Fri 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,,,,,

Course Description   This course aims to deepen students' research content. Faculty and students will provide presentations and engage in mutual discussions of the latest research. This will help students acquire broader knowledge of diverse specialized disciplines. Students will also examine and discuss literature selected from related disciplines. The course will help students discover new directions for research by helping them plot their research themes on a time axis (the flow of students' research from the past to the present) and on a space axis (the relationship of students' research to research being conducted in neighboring disciplines). It will also help them reexamine their research in relation to these axes. This course has three objectives related to students' research themes: (1) deepening students' abilities to think so they can achieve higher standards; (2) deepening students' understanding of the latest research trends in various specialized fields; (3) helping students acquire skills needed to report research in an interesting, easily-understandable way; and (4) helping students acquire skills required to conduct constructive discussions.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	14	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Psychology and Design Studies

Code 10X463   Course Year Doctor Course   Term 2nd term   Class day & Period Fri 2nd   Location

Credits 2   Restriction   Lecture Form(s) Seminar   Language Japanese   Instructor ,,,,,

Course Description   This course aims to deepen students' research content. Faculty and students will provide presentations and engage in mutual discussions of the latest research. This will help students acquire broader knowledge of diverse specialized disciplines. Students will also examine and discuss literature selected from related disciplines. The course will help students discover new directions for research by helping them plot their research themes on a time axis (the flow of students' research from the past to the present) and on a space axis (the relationship of students' research to research being conducted in neighboring disciplines). It will also help them reexamine their research in relation to these axes. This course has three objectives related to students' research themes: (1) deepening students' abilities to think so they can achieve higher standards; (2) deepening students' understanding of the latest research trends in various specialized fields; (3) helping students acquire skills needed to report research in an interesting, easily-understandable way; and (4) helping students acquire skills required to conduct constructive discussions.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	14	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Data Analysis in Psychology and Design Studies

Code   10X464   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 2nd   Location

Credits   2   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,,

Course Description   This course will review the major methods used in multivariate data analysis (factor analysis, regression analysis, structural equation modeling, etc.) of psychological data employed during the exploration of human cognition and design processes. The primary goal of this course is to increase students' abilities to understand and perform these types of statistical analyses on their own experimental data. Students will learn to use a number of software packages (SPSS, R, etc.). In addition, students will acquire the skills required to write high-level academic papers.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	14	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design of Cognitive Functions

Code   10X465   Course Year   Doctor Course   Term   1st term   Class day & Period   Wed 4th   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Instructor   ,

Course Description   This course explains recent findings related to the relationship that exists between the brain and cognitive function. Primary focus is placed on frontal lobe functions, memory, emotion, and social cognition. The objectives of this course are to help students develop a foundation in cognitive neuroscience and to help students employ this knowledge in their research. These objectives will be achieved by presenting essential knowledge in the simplest manner possible. Students will acquire and improve their developmental and constructive thinking abilities by discussing lectures presented by eminent researchers worldwide.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	14	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X466

Advanced Studies: Cognitive Sciences

Code   10X466   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Intensive Lecture   Language   Japanese   Instructor   ,

Course Description   Language divides the world by the use of symbols known as words. However, how do children learn to use language? How do children change as they acquire language? How dependent is thought on language? How does thought differ among speakers of different languages? In this course, students will consider the following questions by engaging in experimental research in cognitive science: (1) what are the processes involved in child language acquisition; (2) what are the processes involved in the development of concepts; (3) what kinds of relationships exist between language and concept learning; and (4) what kinds of relationships exist between language and thought?

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Brain Function and Design Studies

Code　10X467　Course Year　Doctor Course　Term　2nd term　Class day & Period　Tue 3rd　Location

Credits　2　Restriction　　Lecture Form(s)　Seminar　Language　Japanese　Instructor　,

Course Description　This seminar, which is primarily rooted in neuroscience, is aimed at graduate students who are currently engaged in research or are interested in engaging in research related to cognition, emotion, and broader areas in the life sciences. Students will participate in a review of research that may serve as a background to students' own areas of interest. This course will consider practical aspects involved in the study of human cognition at an advanced level. Topics include experiment planning, measurement of brain functions, data analysis and interpretation, and drafting and completion of research papers.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	14	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Field based Learning/Problem based Learning (FBL/PBL) 1
／　　　　　　(FBL/PBL)

Code　10X471　　Course Year　Master Course　　Term　1st term　　Class day & Period　　Location

Credits　1　　Restriction　　　　Lecture Form(s)　Exercise　　Language　Japanese　　Instructor　　,

Course Description　　This course is designed to enable students to put design theories and design methods into practice and to acquire these theories and methods. In Field based Learning (FBL), students can experience the process of finding the problems to be solved from a given real-world fields as a team project. In Problem based Learning (PBL), students can experience the process of solving a given real-world problem as a team project.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	13	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Field based Learning/Problem based Learning (FBL/PBL) 2
/　　　　　(FBL/PBL)

Code　10X472　Course Year　Master Course　Term　2nd term　Class day & Period　　　Location

Credits　1　Restriction　　　Lecture Form(s)　Exercise　Language　Japanese　Instructor　,

Course Description　This course is designed to enable students to put design theories and design methods into practice and to acquire these theories and methods. In Field based Learning (FBL), students can experience the process of finding the problems to be solved from a given real-world fields as a team project. In Problem based Learning (PBL), students can experience the process of solving a given real-world problem as a team project.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	13	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Open Innovation Practice 1

Code   10X473   Course Year   Doctor Course   Term   1st term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Exercise   Language   Japanese   Instructor   ,

Course Description   This course facilitates additional skills development opportunities. Especially students are expected to train the skills necessary to develop and manage their careers across a broad range of employment sectors, including academia in design. To attain this, students are to conduct with the relevant specialists and stakeholders and to appreciate the importance of initiating new projects for open innovation, proactively reacting to newly identified needs or aiming to resolve persistent problems. For this problem solving, students are requested to form a team and to develop and maintain effective relationships with colleagues by working in a collaborative environment and to organizing a series of workshops with those colleagues. Through these practices, students are obliged to understand leadership in team environments, recognizing the strengths of team members and work effectively to achieve mutual goals as well as to understand the role of innovation and creativity in research. Students are to respond to abstract problems that expand and redefine existing procedural knowledge. Also they are required to demonstrate effective writing and publishing skills, demonstrating design methodologies and exhibiting knowledge of design theories.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	13	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Open Innovation Practice 2

Code   10X474   Course Year   Doctor Course   Term   2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Exercise   Language   Japanese   Instructor   ,

Course Description   This course facilitates additional skills development opportunities. Especially students are expected to train the skills necessary to develop and manage their careers across a broad range of employment sectors, including academia in design. To attain this, students are to conduct with the relevant specialists and stakeholders and to appreciate the importance of initiating new projects for open innovation, proactively reacting to newly identified needs or aiming to resolve persistent problems. For this problem solving, students are requested to form a team and to develop and maintain effective relationships with colleagues by working in a collaborative environment and to organizing a series of workshops with those colleagues. Through these practices, students are obliged to understand leadership in team environments, recognizing the strengths of team members and work effectively to achieve mutual goals as well as to understand the role of innovation and creativity in research. Students are to respond to abstract problems that expand and redefine existing procedural knowledge. Also they are required to demonstrate effective writing and publishing skills, demonstrating design methodologies and exhibiting knowledge of design theories.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	13	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Filed Internship

Code   10X475   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Instructor   ,

Course Description   This course provides a program of field internship in which doctoral students are sent to external fields out of the campus (either of domestic or abroad) for mid- or long-term periods of 30 days or longer to be engaged in the group work. The proposals to attend the international internship programs organized by the third parties such as IAESTE, ISEC, and Vulcanus are also accepted. Recipients are selected via a competitive assessment process evaluated at the steering committee as well as by overseas researchers. Recipients are obliged to exhibit knowledge of advances and developments in design and to demonstrate knowledge by comprehending and effectively employing appropriate design methodologies. Recipients are obliged to be monitored during their stay by their mentors and to give a debriefing presentation when they come back from the internship.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	13	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Research-Intensive Abroad Internship

Code   10X476   Course Year   Doctor Course   Term   1st+2nd term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Language   Instructor   ,

Course Description   This course provides a program of international internship in which doctoral students are sent to our partner institutions for mid- or long-term periods of 30 days or longer to foster leadership in collaborative reserch environments. This program fosters students capable of creating and developing novel academic and research fields with a vision that crosses different academic boundaries and is to let them conduct independent and autonomous research projects. The proposals to attend the international mid-term schools organized by our partnership institutions are also accepted. Recipients are selected via a competitive assessment process evaluated at the steering committee as well as by overseas researchers with respect to feasibility, significance, preparedness etc. of the proposed plans. Recipients are obliged to be monitored during their stay by their mentors and to give a debriefing presentation when they come back from the internship.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	13	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design Science Exercise, Adv. 1

Code   10X481   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Design Science Exercise, Adv. 2

Code   10X482   Course Year   Master Course   Term   1st+2nd term   Class day & Period   Location

Credits   4   Restriction   Lecture Form(s)   Seminar   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

698561

Communication Methodology Seminar

Code 698561 Course Year Master and Doctor Course Term 1st+2nd term Class day & Period

Location Credits 1 Restriction Lecture Form(s) Intensive Lecture Language Japanese

Instructor ,

Course Description This seminar is a short-term intensive seminar to enhance the ability of communication, and consists of Japanese and English courses.
The aim of Japanese course is to strengthen the ability to speak and communicate in the scenes of giving a speech, conducting negotiations. Executive announcers of the Japanese center of NHK Communications Training Institute conduct the seminar by concentrating the know-how owned by the center.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Communication Methodology Seminar

Code　698562　　Course Year　Master and Doctor Course　　Term　1st+2nd term　　Class day & Period

Location　　　Credits　1　　Restriction　　　Lecture Form(s)　Intensive Lecture　　Language　English

Instructor　　,

Course Description　　This seminar is a short-term intensive seminar to enhance the ability of communication, and consists of Japanese and English courses.
　The aim of English course is to strengthen presentation skills and speaking skills in English. Instructors of Berlitz Japan conduct the seminar by concentrating the rich contents owned by the Berlitz Japan.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Informatics Practice I

Code   698581   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 4th

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Seminar   Language

Instructor   ,

Course Description   This course is dedicated for non-CS (computer science)-major students to understand fundamental information technologies and acquire "information skills" through practices. Enrolled students learn fundamental information technologies and acquire the ability of "information literacy" for acquiring, generating, managing, analyzing, and presenting information.

 Practices in this course include computer programming, but neither programming experience nor knowledge of specific programming language are required.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	7	
	2	
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Informatics Practice II

Code 698582 Course Year Master and Doctor Course Term 2nd term Class day & Period Fri 5th

Location Credits 1 Restriction No Restriction Lecture Form(s) Seminar Language Japanese

Instructor ,

Course Description This practice course is to explore and identify "information skills" that are needed in the research of architecture, mechanical engineering, pedagogy, and management science. Information-skill topics are designed by enrolled students themselves in a workshop style. Possible practice topics are (A) Web programming, (B) Web-based survey (crowd-sourcing), (C) 3D CG contents creation, (D) Human behavior analysis, (E) Information Design, and (F) Algorithmic architecture.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X491

Advanced Studies: Research Methods in Psychology and Design Studies

Code   10X491   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 4th

Location   Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   ,

Course Description   The goal of this course is for students to acquire skills required to convey research results in a precise and efficient manner by the use of quantitative data drawn from fields such as design study, psychology, and pedagogy. Students will deepen their understanding of useful and advanced statistical methods employed in the conduct of empirical research and the testing of hypotheses. They will learn to apply these methods to their own research. The course will provide an outline of statistical methods and introduce statistical mechanisms. It will teach students the proper use of these methods based on examinations of research examples. Students will conduct literature reviews to discover studies that employ these methods in their investigations. Students will examine and discuss these studies on several occasions.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Seminar on Research Methods in Psychology and Design Studies

Code   10X492   Course Year Master and Doctor Course   Term 1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s) Intensive Lecture   Language Japanese   Instructor   ,

Course Description   This course has three objectives: (1) students will consider system design at various levels from the perspective of psychology, (2) students will build a foundation that will help them conduct psychological experiments and surveys to examine a variety of research ideas, and (3) students will gain a better understanding of basic statistical methods required to test hypotheses by the use of psychological data. The following themes will be covered in a seminar format: methodology in psychology research; comparisons of various methods, characteristics, and processes involved in data collection; theories of and methods employed in psychological experiments and quasi-experiments; and the basic statistics used to test hypotheses and replicate previous findings.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Communication Strategies for Design Research

Code   10X490   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Management Research Methodology

Code   10X493   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Management Research

Code   10X494   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Design for Biomedical and Pharmaceutical Applications

Code   10H636   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Mon 2nd

Location   A2-307   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to the Design and Implementation of Micro-Systems

Code   10V201   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 5th

Location   C3-Lecture room 1 or 3   Credits   2   Restriction   No Restriction

Lecture Form(s)   Lecture and Pactice   Language   English

Instructor   O. Tabata,H. Kotera,T. Tsuchiya,R. Yokokawa,

Course Description   This is a joint lecture with Hong Kong University of Science and Technology (HKUST). A team consists of two students from each University work together to fullfill the assignment (design a microsystem) through paper survey, analysis,design, and presentation. A student can acquire not only the basic knowledge of a microsystem, but also comprehensive ability of English such as technical knowledge in English, skill for team work, and communication.

Grading   Presentation, Assignments, and Achievement

Course Goals   Acquire the knowledge and skill to design and analyze a microsystem.

Course Topics

Theme	Class number of times	Description
Tutorial on microsystem CAD software	3	Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.
Lecture and Task Introduction	2	Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechical Systems) utilizing microfabrication technology.
Design and analysis work	3	Analyze and design a microsystem by communicating with a team member of HKUST.
Presentation I	2	The designed device and its analyzed results is presented in detail by team in English.
Evatuation of device	3	Evaluate the fabricated microsystem.
Presentation II	2	The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.

Textbook

Textbook(supplemental)

Prerequisite(s)   Students are required to take the 10G203 course "Micro Process and Material Engineering" provoded in 1st term.

Independent Study Outside of Class

Web Sites

Additional Information   The student of this class is required to register to the course 10G205 "Microsystem Engineering" provided at Friday 4th so as to be able to take consecutive classes at Friday 4th and 5th. Those who want to take this course have to take training course for CAD in advance. Those students who want to take this course has to contact Prof. Tabata (tabata@me.kyoto-u.ac.jp) by the end of 1st term.

Micro Process and Material Engineering

Code   10G203   Course Year   Master Course   Term   1st term   Class day & Period   Mon 4th

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   H. Kotera,O. Tabata,K. Eriguchi,I. Kanno,T. Tsuchiya,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Semiconductor microfabrication	3	
Thin-film process and evaluation	3	
Silicon micromachining	3	
3D lithography	3	
Soft-micromachining	2	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10G209

Multi physics Numerical Analysis

Code 10G209 Course Year Master and Doctor Course Term 2nd term Class day & Period Mon 1st

Location C3-Lecture Room 3 Credits 2 Restriction Lecture Form(s) Lecture Language Japanese

Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	2	
	2	
	5	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to Biomedical Engineering

Code   10W603   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   No Restriction   Lecture Form(s)   Intensive Lecture   Language   Japanese

Instructor   ,,,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Finite Element Methods

Code   10G041   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture and Practice

Language   English   Instructor   Kotera and Nishiwaki,

Course Description   This course presents the basic concept and mathematical theory of the Finite Element Method (FEM), and explains how the FEM is applied in engineering problems. We also address important topics such as the physical meaning of geometrical non-linearity, material non-linearity, and non-linearity of boundary conditions, and we explore numerical methods to deal with these nonlinearities. Also, we guide students in class in the use of software to solve several numerical problems, to develop practical skill in applying the FEM to engineering problems.

Grading   Grading is based the quality of two or three reports and the final exam.

Course Goals   The course goals are for students to understand the mathematical theory of the FEM and the numerical methods for analyzing non-linear problems based on the FEM.

Course Topics

Theme	Class number of times	Description
Basic knowledge of the FEM	3	What is the FEM? The history of the FEM, classifications of partial differential equations, linear problems and non-linear problems, mathematical descriptions of structural problems (stress and strain, strong form and weak form, the principle of energy).
Mathematical background of the FEM	2	Variational calculus and the norm space, the convergence of the solutions.
FEM formulations	3	FEM approximations for linear problems, formulations of iso-parametric elements, numerical instability problems such as shear locking, formulations of reduced integration elements, non-conforming elements, the mixed approach, and assumed-stress elements.
Classifications of nonlinearities and their formulations	4	Classifications of nonlinearities and numerical methods to deal with these nonlinearities.
Numerical practice	2	Numerical practice using COMSOL.
Evaluation of student achievements	1	

Textbook

Textbook(supplemental)   Bath, K.-J., Finite Element Procedures, Prentice Hall

Belytschko, T., Liu, W. K., and Moran, B.., Nonlinear Finite Elements for Continua and Structures, Wiley

Prerequisite(s)   Solid Mechanics

Independent Study Outside of Class

Web Sites

Additional Information

Microsystem Engineering

Code   10G205   Course Year   Master Course   Term   2nd term   Class day & Period   Fri 4th   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   O. Tabata,H. Kotera,T. Tsuchiya,R. Yokokawa,

Course Description   Microsystem covers not only technologies related to individual physical or chemical phenomenon in micro scale, but also complex phenomena which are eveolved from their interaction. In this course, the physics and chemistry in micro and nanoscale will be lectured in contrast to those in macro scale. The various kinds of application devices (ex. physical (pressure, flow, force) sensors, chemical sensors, biosensors, actuators (piezoelectric, electrostatic, and shape memory) and their system are discussed.

Grading   The evaluation will be based on the reports given in each lecture.

Course Goals   Understand the theory of sensing and actuating in microsystem. Acquire basic knowledge to handle various kinds of phenomena in microscale.

Course Topics

Theme	Class number of times	Description
MEMS modeling	2	Multi-physics modeling in microscale. Electro-mechanical coupling analysis.
MEMS simulation	2	System level simulation in MEMS.
Electrostatic microsystem	3	Electrostatic sensors and actuators. Theory and application devices.
Physical sensors	4	Physical sensors as a fundamental application in microsystem. Accelerometer, vibrating gyroscope, pressure sensors.
Micro total analysys system	4	Chemical analysis system and bio-sensing device using microsytem.

Textbook   Provided in the lecture.

Textbook(supplemental)   Provided in the lecture.

Prerequisite(s)   Students are required to take the 10G203 course "Micro Process and Material Engineering".

Independent Study Outside of Class

Web Sites

Additional Information   The student can register only to this class 10G205, but it is required to be able to take consecutive classes at Friday 4th and 5th. Those students who want to take this course has to contact Prof. Tabata (tabata@me.kyoto-u.ac.jp) by the end of 1st term. The student of this class is strongly recommended to take a course 10V201 "Introduction to the Design and Implementation of Micro-Systems"(10V201), which is a practice for designing microsystem. Those who want to take 10V201 have to take training course for CAD in advance.

Introduction to Quantum Science

Code   10C070   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	9	
	2	
	3	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Introduction to Advanced Nuclear Engineering

Code 10C072 Course Year Master and Doctor Course Term 1st term Class day & Period Tue 2nd

Location C3-Lecture Room 5 Credits 2 Restriction Lecture Form(s) Lecture Language Japanese

Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Synthesis

Code   10H649   Course Year   Master Course   Term   1st term   Class day & Period   Wed 2nd

Location   A2-306   Credits   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Physical Properties

Code   10H652   Course Year   Master Course   Term   1st term   Class day & Period   Thu 2nd

Location   A2-307   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Hirokazu Hasegawa, Takenao Yoshizaki, Tsuyoshi Koga, Mikihito Takenaka, Hiroyuki Aoki,

Course Description   A concise explanation is given of physical properties of polymer solutions and polymeric solids along with relevant basic theories.

Grading   Final grades will be evaluated in a comprehensive manner on the basis of attendance, reports, and examinations.

Course Goals   Fundamental knowledge of physical properties of polymer materials.

Course Topics

Theme	Class number of times	Description
Polymer Chain Conformation in Dilute Solutions	3	After a clarification of basic factors which determine the conformations of real polymer chains in dilute solutions, some polymer chain models are introduced to describe the equilibrium conformational behavior of the real chains. Further, behavior of average chain dimensions as a functions of molecular weight is considered based on the chain models.
Thermodynamics and Phase Behavior of Polymer Solutions	3	Various phase transition phenomena in polymer solutions (phase separation, hydration, association, gelation, etc.) are systematically explained from thermodynamic and statistical-mechanical viewpoints. "Phase separation of polymer solutions", "Aqueous polymer solutions", and "Association and gelation of polymers" are discussed in the lectures.
Exercise	1	Exercise in polymer solutions.
Structure and Mechanical Properties of Polymeric Solids	4	Polymeric solids such as rubber and plastics, especially thermodynamics of rubber elasticity, polymer crystallization and crystalline/amorphous higher-order structures, are discussed. Moreover, fundamentals of viscoelastic properties of polymers are introduced to provide the understandings of relaxation phenomena such as glass transition.
Electronic and Optical Properties of Polymeric Solids	3	The electronic and optical properties of polymers is reviewed. The application of polymer materials in the opto-electronics and display devices is also presented.
Exercise	1	Exercise in polymeric solids.

Textbook   Lecture notes distributed in the class.

Textbook(supplemental)

Prerequisite(s)   Fundamental knowledge of physical chemistry.

Independent Study Outside of Class

Web Sites

Additional Information

Reactive Polymers

Code 10H610 Course Year Master and Doctor Course Term 2nd term Class day & Period Wed 2nd

Location A2-307 Credits Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Polymer Structure and Function

Code   10H613   Course Year   Master Course   Term   2nd term   Class day & Period   Thu 2nd

Location   A2-307   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   H. Ohkita

Course Description   In this class, optoelectronic functions of polymeric materials are discussed on the basis of photochemistry and photophysics.   In particular, the importance of designing nanostructures of polymer assembly is highlighted by explaining examples of state-of-the-art applications, which include optical fibers, organic light-emitting diode, and organic solar cells.

Grading   Evaluated with the grade on the final test or the quality of report submitted after the final class.

Course Goals

Course Topics

Theme	Class number of times	Description
Introduction	1	
Conductive Polymers	3	
Photofunctional Polymers	3	
Optoelectronic Polymers	4	

Textbook   None: Some handouts will be dealt in the class of every lecture.

Textbook(supplemental)   None:

Prerequisite(s)   Students are expected to have knowledge of Physical Chemistry and Polymer Chemistry provided in chemisty course for undergraduate.

Independent Study Outside of Class

Web Sites

Additional Information

10H611

Biomacromolecular Science

Code   10H611   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 2nd

Location   A1-001   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biomaterials Science and Engineering

Code   10H633   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Fri 2nd

Location   A2-307   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H021

Engineering for Chemical Materials Processing

Code   10H021   Course Year   Master and Doctor Course   Term   Spring   Class day & Period   Wed 4th   Location   A2-302

Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Dept. of Chemical Engineering, Prof. M.Ohshima

,Dept of Chemical Engineering, Associate Prof. S.Nagamine,

Course Description   Focusing on transport phenomena (flow & rheology, mass flux, heat flux) in polymer processing process, the key relationships among polymer properties, processing schemes, and processing machine are taught.

Grading   40% midterm quiz, 60% exam at end

Course Goals   The objective of this course is to know how the polymers are different in terms of thermal, rheological and mechanical properties. The attendees learn what Tg, Tc, Tm, G' and G" are, how those properties can be measured and how these obtained measurement data can be appreciated. Visual Observation movies relates those properties with the transport phenomena that occur in several polymer processing processes.

Course Topics

Theme	Class number of times	Description
Orientation & Introduction of Polymer Processing		The characteristics of polymers are reviewed by exercising the characterization of general polymers, like PE, PP, PLA, PC, PS, PVC in terms of appearance, thermal and mechanical properties.
State of Thermoplastic Polymer	1	The relationship among pressure-volume-temperature of thermoplastic polymer is described. The way of identifying the Tg, Tc is taught. Several equations of state are introduced.
Thermal Properties of Thermoplastic Polymers	2	Several important thermal properties of thermoplastic polymers, such as glass transition temp, Tg, crystallization temp, Tc, and melting temp, Tm are explained together with the measurement methods of those thermal properties. The latest measurement device, Flash DSC, is introduced with some of the interesting data of crystallization process.
Rheological Properties of Thermoplastic Polymers	2	The basic of polymer rheology, viscosity and elasticity, is given. Several phenomena of non-Newtonian fluid are introduced. The fundamental constitutive equations, Maxwell and Voigt models, describing the viscoelasticity of the polymers are explained. Exercising on identification of polymer structures, such as the degree of entanglement, molecular weight, presence of long-chain branch from the rheological data, relationship between polymer rheology and polymer structure is explained.
Basic Flows in Polymer Processing		The basics of Polymer Processing are the series of Melt, Flow and Shape. Here the class focus on the Flow. The two types flow, i.e., drag and pressure flows are explained together with master equation. Without solving the mathematical equations, the skill of estimating the velocity profile is cultivated.
Visual Observation of Flow Phenomena in Processing Machine		Entertaining several visual observation movies showing the flow phenomena in real polymer processing machine like injection molding machine and extruder, The effects of thermal and rheological properties of polymer on those flow phenomena are clarified.
Phase separation and Morphology Formation	2	The basic of phase separation of polymer-polymer, polymer-solvent are taught.
Phase Separation Phenomena in Polymer Processing		Several polymer processing schemes exploiting a phase separation phenomenon are introduced. Synergistic design of the polymer properties, processing scheme and processing machine is stressed.
Check what we learn	1	During the class, plenty of quiz are given to check the understanding.

Textbook   Handout

Textbook(supplemental)   Agassant, J.F., Polymer Processing: Principles and Modeling

Prerequisite(s)   Basic of Transport Phenomena

Independent Study Outside of Class

Web Sites

Additional Information

Chemistry of Polymer Materials

Code   10H007   Course Year   Master Course   Term   Class day & Period   Fri 2nd   Location   A2-302

Credits   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	2	
	6	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Chemistry of Biomaterials

Code 10H031   Course Year Master Course   Term   Class day & Period Tue 2nd   Location A2-302

Credits   Restriction   Lecture Form(s)   Language Japanese   Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	12	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Chemistry of Functional Materials

Code 10H010 Course Year Master Course Term Class day & Period Wed 1st Location A2-302

Credits Restriction No Restriction Lecture Form(s) Lecture Language Japanese Instructor ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10S022

Synthesis of Polymer Materials,Advanced

Code   10S022   Course Year   Doctor Course   Term   2nd term   Class day & Period   Fri 5th

Location   A2-302   Credits   2   Restriction   No Restriction   Lecture Form(s)   Seminar   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	15	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Biomedical Engineering

Code   10H209   Course Year   Master and Doctor Course   Term   Class day & Period   Thu 2nd

Location   A2-304   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Biology

Code　10H812　　Course Year　Master and Doctor Course　　Term　1st term　　Class day & Period　Thu 2nd

Location　A2-308　　Credits　　Restriction　No Restriction　　Lecture Form(s)　Lecture　　Language　Japanese

Instructor　　,,

Course Description　　Biological responses are elicited at the interface of intrinsic genetic information and extrinsic environmental factors. This course discusses on molecular aspects of brain function and immunity. Experimental tools such as fluorescent probes for second messenger molecules are also explained through performance of experiments using the probes.

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Basics	1	
Principles of neurotransmission	3	
Immunity and inflammation	2	
Gaseous bioactive molecules	2	
Experiments to observe cellular responses	3	

Textbook　　Provided in the course

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biorecognics

Code   10H815   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 2nd

Location   A2-308   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Bioorganic Chemistry

Code   10H813   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 2nd

Location   A2-308   Credits   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	1	
	1	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Microbiology and Biotechnology

Code   10H816   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   A2-308   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   English

Instructor   Haruyuki Atomi, Tamotsu Kanai

Course Description   This lecture will introduce the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. Commonly used tools in the fields of biochemistry, molecular biology and genetics will also be discussed. In addition, methods to utilize cells and their enzymes in biotechnology will be introduced. Lectures will be given in English, with the aim to improve communication/discussion skills.

Grading   Grading will be based on presentations (60%) and attendance (40%).

Course Goals   Basic knowledge on the various forms of life that are present on our planet as well as the mechanisms involved in sustaining their life. An understanding of the commonly used tools in the fields of biochemistry, molecular biology and genetics as well as methods to utilize cells and their enzymes in biotechnology. Lectures will be given in English, with the aim to improve communication/discussion skills.

Course Topics

Theme	Class number of times	Description
Introduction	1	Diversity of life, classification of organisms, structure and function of fundamental biomolecules.
Basic mechanisms to sustain life	3	Strategies to conserve energy, biosynthesis, cell division, cell differentiation.
Strategies to adapt to environmental conditions	2	Effect of environmental conditions on cells and biomolecules, thermophiles, acidophiles and their enzymes.
Protein engineering	2	Methods to study enzymes and enzyme reactions, methods to enhance their performance.
Cell engineering	2	Methods utilized in metabolic engineering, cell surface engineering, synthetic biology.
Topic discussion	1	Particular topics will be chosen for discussion

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Organic Chemistry

Code   10H818   Course Year   Master Course   Term   1st term   Class day & Period   Tue 1st

Location   A2-306   Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Professor Jun-ichi Yoshida and other professors

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
Chemoselectivity	2	Introduction and chemoselectivity
Regioselectivity	2	Controlled Aldol Reactions
Stereoselectivity	2	Stereoselective Aldol Rections
Strategies	2	Alternative Strategies for Enone Synthesis
Choosing a Strategy	2	The Synthesis of Cyclopentenones
Summary	1	Summary and outlook

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Organic Chemistry 2 Continued

Code   10P818   Course Year   Master 1st   Term   1st term   Class day & Period   Tue 1st

Location   A2-306   Credits   Restriction   No Restriction   Lecture Form(s)   Seminar   Language   Japanese

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	5	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H836

Advanced Biological Chemistry

Code 10H836   Course Year Master Course   Term 1st term   Class day & Period   Location A2-308

Credits 3   Restriction No Restriction   Lecture Form(s) Lecture   Language Japanese   Instructor ,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Advanced Biological Chemistry 2 Continued

Code   10P836   Course Year   Master Course   Term   Class day & Period   Location   Credits   1

Restriction   Lecture Form(s)   Intensive Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	3	
	3	
	2	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10H448

Biomolecular Function Chemistry

Code 10H448 Course Year Master and Doctor Course Term (not held; biennially)

Class day & Period Mon 2nd Location A2-304 Credits 1.5 Restriction No Restriction

Lecture Form(s) Lecture Language Japanese Instructor Shirakawa, Sugase

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	2	
	3	
	2	
	3	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biomechanics

Code   10V003   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 4th

Location   Credits   2   Restriction   Lecture Form(s)   Language   Japanese   Instructor   Taiji Adachi,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10D450

Biomolecular Dynamics

Code   10D450   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Thu 3rd

Location   C3-Lecture Room 2   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Robotics

Code   10B407   Course Year   Master Course   Term   2nd term   Class day & Period   Mon 2nd

Location   C3-Lecture Room 5   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture

Language   Japanese   Instructor   Fumitoshi Matsuno,

Course Description   Understanding of intelligent behaviors of living things is very interesting. And realization of their intelligent motion by a robot is also attractive for mechanical engineering. In this lecture, we consider basic understanding of beautiful human skill "manipulation" on the point of view of dynamics and control. First modeling methodologies for a rigid multibody system and a general dynamic model of a manipulator are provided. Next, a typical nonlinear control law is introduced and some problems for applying the controller are shown. Based on nature of the dynamics of the manipulator, a very simple and robust controller can be derived by designing energy of the system. This lecture provides modeling methodologies and controller design strategies of the rigid multibody system and we analyze a beautiful human skill of the manipulation.

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Materials

Code   10H413   Course Year   Master and Doctor Course   Term   (not held; biennially)

Class day & Period   Wed 2nd   Location   A2-304   Credits   1.5   Restriction   No Restriction

Lecture Form(s)   Lecture   Language   Japanese   Instructor   A. Ito

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	4	
	3	
	4	
	1	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Special Topics in Transport Phenomena

Code 10H002   Course Year Master and Doctor Course   Term Spring term   Class day & Period   Location

Credits   1.5   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor   Department of Chemical Engineering, Professor, Ryoichi Yamamoto

Course Description   After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on " Langevin Equation", " Hydrodynamic Interaction", and " Linear Response Theory" will also be given.

Grading   Answers to several questions and exercises, which will be given during the course, are used to judge.

Course Goals   To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

Course Topics

Theme	Class number of times	Description
- Polymeric Liquids / Rheology	6	Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation	3	To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction	2	To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.
Understanding Check	1	

Textbook   Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

Textbook(supplemental)   Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowlter, (Cambridge)

Prerequisite(s)   Under graduate level basic knowledge on " Fluid Mechanics / Transport Phenomena" and basic mathematics including " Vector Analyses" are required.

Independent Study Outside of Class

Web Sites

Additional Information   This is an biennial course which will be open in 2016, 2018, 2020, ...

Advanced Topics in Transport Phenomena　English lecture

Advanced Topics in Transport Phenomena

Code　10H003　　Course Year　Master and Doctor Course　　Term　Spring term

Class day & Period　Tue 4th　　Location　A2-305　　Credits　1.5　　Restriction　No Restriction

Lecture Form(s)　Lecture　　Language　English

Instructor　Department of Chemical Engineering, Professor, Ryoichi Yamamoto

Course Description　After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on "Langevin Equation", "Hydrodynamic Interaction", and "Linear Response Theory" will also be given.

Grading　Answers to several questions and exercises, which will be given during the course, are used to judge.

Course Goals　To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

Course Topics

Theme	Class number of times	Description
- Polymeric Liquids / Rheology	6	Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation	3	To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction	2	To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.
Understanding Check	1	

Textbook　Transport Phenomena 2nd Ed., Bird, Stewart, Lightfoot, (Wiley)

Textbook(supplemental)　Introduction to Polymer Physics, Doi, (Oxford) Theory of Simple Liquids 4th Ed., Hansen, McDonald, (Academic Press) Colloidal Dispersions, Russel, Saville, and Schowlter, (Cambridge)

Prerequisite(s)　Under graduate level basic knowledge on "Fluid Mechanics / Transport Phenomena" and basic mathematics including "Vector Analyses" are required.

Independent Study Outside of Class

Web Sites

Additional Information

Green and Sustainable Chemistry

Code 10H202 Course Year Master and Doctor Course Term Class day & Period Location Credits

Restriction No Restriction Lecture Form(s) Lecture Language Japanese

Instructor K.Ohe,Y.Tsuji,T.Sakka,

Course Description

Grading

Course Goals

Course Topics

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

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Mechanics and Dynamics, Fundamental

Code   10X601   Course Year   Master Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description
	1	
	2-3	
	4-5	
	6-7	
	8-9	
	10-11	
	12	

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Continuum Mechanics(Integrated Medical Engineering)

Code   10X602   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 3rd

Location   Credits   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X603

Medical Electronics

Code   10X603   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 3rd

Location   Credits   2   Restriction   No Restriction   Lecture Form(s)   Lecture   Language   Japanese

Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Basic Material Chemistry

Code   10X604   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 2nd

Location   A2-308   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Molecular Analysis of Life

Code   10X605   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Fri 1st

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Image Processing Basics

Code   10X606   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Tue 1st

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biopharmaceutics

Code   10X607   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 2nd

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Human Anatomy

Code   10X608   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Location

Credits   5   Restriction   Lecture Form(s)   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Physiology(Integrated Medical Engineering)

Code   10X609   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Wed 3rd

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Medical Chemistry

Code   10X610   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English   Instructor   ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X611

Geriatrics, Gerontology, and Aging Science

Code   10X611   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Medical Ethics

Code   10X613   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Thu 5th

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X614

Introduction to numerical simulation

Code 10X614 Course Year Master and Doctor Course Term 2nd term Class day & Period Tue 4th

Location Credits 2 Restriction Lecture Form(s) Lecture Language Japanese Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Health Economics

Code   10X615   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X616

Intellectual Property & Global Standardization

Code   10X616   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Genome cohort study

Code   10X617   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Wed 2nd

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   English   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X618

Regenerative Medicine

Code   10X618   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Tue 2nd

Location   Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Medical Engineering for Society I

Code 10X631 Course Year Master and Doctor Course Term 2nd term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Lecture Language Japanese Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Medical Engineering for Society I

Code 10X631 Course Year Master and Doctor Course Term 2nd term Class day & Period Location

Credits 2 Restriction Lecture Form(s) Lecture Language Japanese Instructor

10X632

Medical Engineering for Society II

Code   10X632   Course Year   Master and Doctor Course   Term   1st term   Class day & Period   Location

Credits   2   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Diagnostic Pathology : lecture

Code   10X700   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s) Lecture   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Radiology   MRI introduction : lecture
MRI

Code   10X701   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Lecture   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Code   10X701   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Minimally invasive therapeutics: lecture

:

Code   10X702   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Lecture   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Code   10X702   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Lecture   Language   Instructor

Biomaterials and Artificial Organs: lecture

Code   10X703   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s) Lecture   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Medical informatics : lecture

Code   10X704   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X705

Inspection equipment studies Science research equipment : lecture

Code   10X705   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Lecture   Language   Japanese   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Medical and life support systems : lecture

Code 10X706 Course Year Master and Doctor Course Term 1st term Class day & Period Location

Credits 1 Restriction Lecture Form(s) Lecture Language Japanese Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X707

Diagnostic Pathology: practice

Code 10X707   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s) Exercise   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Radiology　MRI introduction:practice
MRI

Code　10X708　　Course Year　Master and Doctor Course　　Term　2nd term　　Class day & Period　　Location

Credits　1　　Restriction　　　Lecture Form(s)　Exercise　　Language　　　Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Radiology　MRI introduction:practice
MRI

Code　10X708　　Course Year　Master and Doctor Course　　Term　2nd term　　Class day & Period　　Location

Credits　1　　Restriction　　　Lecture Form(s)　Exercise　　Language　　　Instructor

10X709

Minimally invasive therapeutics: practice

Code 10X709 Course Year Master and Doctor Course Term 2nd term Class day & Period   Location

Credits 1 Restriction   Lecture Form(s) Exercise Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Code 10X709 Course Year Master and Doctor Course Term 2nd term Class day & Period   Location

Biomaterials and Artificial Organs: practice

Code   10X710   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Biomaterials and Artificial Organs: practice

Code   10X710   Course Year   Master and Doctor Course   Term   2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Instructor

Medical informatics: practice

Code 10X711   Course Year Master and Doctor Course   Term 2nd term   Class day & Period   Location

Credits   1   Restriction   Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Inspection equipment studies Science research equipment: practice

Code 10X712 Course Year Master and Doctor Course Term 2nd term Class day & Period Location

Credits 1 Restriction Lecture Form(s) Exercise Language Japanese Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X713

Medical and life support systems: practice

Code 10X713 Course Year Master and Doctor Course Term 1st term Class day & Period Location

Credits 1 Restriction Lecture Form(s) Exercise Language Japanese Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

debate I

debate

Code 10X641 Course Year Term 2nd term Class day & Period Location Credits 1 Restriction

Lecture Form(s) Language Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X642

debate

debate

Code   10X642   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

debate

debate

Code   10X643   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X644

debate

debate

Code   10X644   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

debate

debate

Code 10X645   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X661

Internship in Foreign Countries

Code 10X661 Course Year Term Class day & Period Location Credits Restriction

Lecture Form(s) Language Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Internship (industrial and public parties)

Code 10X663 Course Year Term Class day & Period Location Credits Restriction

Lecture Form(s) Language Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X671

Experiments and Exercises on Integrated Medical

Code   10X671   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Experiments and Exercises on Integrated Medical

Code   10X672   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X681

Integrated Medical Engineering Seminar A

(

Code 10X681 Course Year Term Class day & Period Location Credits Restriction

Lecture Form(s) Language Instructor ,

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Integrated Medical Engineering Seminar B

(

Code	10X682	Course Year	Term	Class day & Period	Location	Credits	Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Special Seminar A on Integrated Medical Engineering
A

Code 10X683	Course Year	Term	Class day & Period	Location	Credits	Restriction

Lecture Form(s)　　Language　　Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Special Seminar B on Integrated Medical Engineering
B

Code   10X684   Course Year   Term   Class day & Period   Location   Credits   Restriction

Lecture Form(s)   Language   Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

10X685

Special Seminar C on Integrated Medical Engineering
C

Code	10X685	Course Year	Term	Class day & Period	Location	Credits	Restriction

Lecture Form(s)　　　Language　　　Instructor

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

Special Seminar D on Integrated Medical Engineering

D

| Code | 10X686 | Course Year | Term | Class day & Period | Location | Credits | Restriction |

| Lecture Form(s) | Language | Instructor |

Course Description

Grading

Course Goals

Course Topics

Theme	Class number of times	Description

Textbook

Textbook(supplemental)

Prerequisite(s)

Independent Study Outside of Class

Web Sites

Additional Information

2016

[D] Interdisciplinary Engineering Course Program

2016   4   1

615-8530

2016

[A] Common Subjects of Graduate School of Engineering

[B] Master's Program

[C] Advanced Engineering Course Program

[D] Interdisciplinary Engineering Course Program

http://www.t.kyoto-u.ac.jp/syllabus-gs/

(KULINE)

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