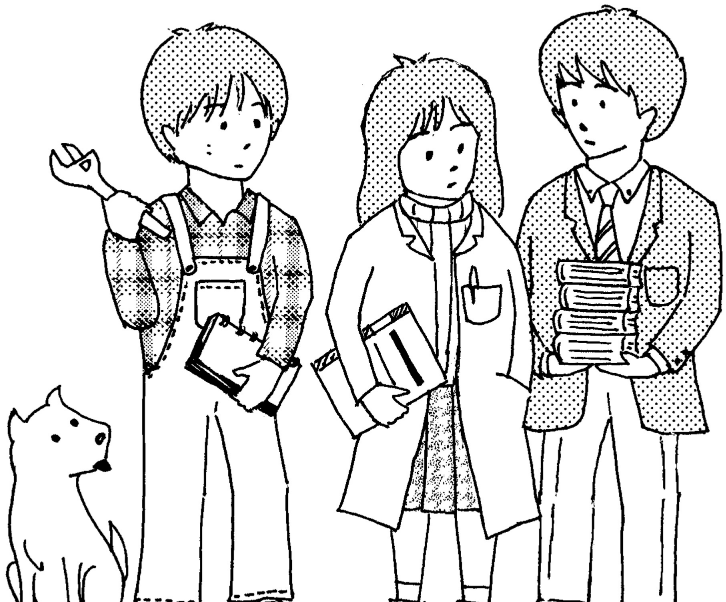
SYLLABUS 2012

[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（Interdisciplinary Engineering Course Program (3yr Course)）

10G047

Applied Mechanics
応用力学

【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)】

【Web Sites】

【Additional Information】

10G045

Complex Mechanical Systems
複雑系機械工学

【Code】10G045 【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)】

【Web Sites】

【Additional Information】

Advanced Mechanical Engineering

先端機械システム学通論

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

【Class day & Period】Tue 5th and Thu 4th 【Location】Engineering Science Depts Bldg.-213 or a teacher's office

【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
	2	
	2	
	2	
	2	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10K004

New Engineering Materials, Adv.（English lecture）
新工業素材特論（英語科目）

【Code】10K004 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 5th

【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2

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

【Course Description】Outline: New materials are necessary for the advancement of high technologies, but in order to develop these new materials for practical applications, a number of problems must be solved. In this course, the problems encountered in the fields of chemical engineering, electrical / electronic engineering, mechanical engineering and civil engineering are discussed. Discussions are also held on natural resources, and how computers are being used in the development of new materials. Lectures are given in English.

【Grading】Credit: The evaluation of a student ’ s work will be given on a pass / fail basis, based on his / her attendance and reports, not on examinations.(1) Attending the class 10 times or more and submitting at least 5 reports with passing marks is required to receive 2 credits.(2) A report assignment will be given by every lecturer and must be submitted within 2 weeks from the end of the lecture.(3) A student ’ s report on any lecture from which he / she is absent will not be accepted.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	15	

【Textbook】

【Textbook(supplemental)】Class handouts

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G001

Applied Numerical Methods
応用数値計算法

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

【Location】Engineering Science Depts Bldg.-313 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Toru Ikeda

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction	1	
Numerical Error, Approximation	1	
Linear simultaneous equation 1	1	
Least square approximation	1	
Linear simultaneous equation 2	1	
Singular value decomposition	1	
Eigenvalue analysis	2	
Non-linear equation	1	
Normal differential equation and numerical integral	2	
Numerical analysis of partial differential equation	3	
Examination	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G003

Solid Mechanics, Adv.

固体力学特論

【Code】10G003 【Course Year】Master Course 【Term】1st term 【Class day & Period】Thu 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
	2	
	2	
	3	
	3	
	3	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G005

Thermal Science and Engineering

熱物理工学

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

【Location】Engineering Science Depts Bldg.-315 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】H. Yoshida & M. Matsumoto

【Course Description】

【Grading】

【Course Goals】

【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 application	2-3	
(Y) Entropy and free energy: revisit	1	
(Y) Science of atmosphere and ocean	3	
(Y) Hydrogen energy	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Thermodynamics, Statistical physics, Heat transfer engineering, Numerical analysis etc.

【Web Sites】

【Additional Information】

10G007

Introduction to Advanced Fluid Dynamics

基盤流体力学

【Code】10G007 【Course Year】Master Course 【Term】1st term 【Class day & Period】Tue 3rd

【Location】Engineering Science Depts Bldg.-315 【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)】

【Web Sites】

【Additional Information】

Quantum Condensed Matter Physics

量子物性物理学

【Code】10G009 【Course Year】Master Course 【Term】1st term 【Class day & Period】Wed 5th

【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	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G011

Design and Manufacturing Engineering

設計生産論

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

【Location】Engineering Science Depts Bldg.-315 【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	
	3	
	2	
	3	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G013

Dynamic Systems Control Theory

動的システム制御論

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

【Location】Engineering Science Depts Bldg.-315 【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	
	4	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G057

Engineering Ethics and Management of Technology

技術者倫理と技術経営

【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

【Web Sites】No Web Site

【Additional Information】Nothing particular

10E001

Special Topics in Transport Phenomena
移動現象特論

【Code】10E001 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 4th

【Location】A2-305 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】R.Yamamoto

【Course Description】Theoretical approaches on momentum, heat, and mass transports will be discussed. For example, problems of non-steady transport such as transient behavior, hydrodynamics of complex fluids such as polymeric liquids will be treated.

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	3	
	3	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C076

Fundamentals of Magnetohydrodynamics
基礎電磁流体力学

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

【Location】Bldg.No.1-Nuclear Engineering 2 【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)】Fundamentals of fluid mechanics and electromagnetism

【Web Sites】

【Additional Information】

10F003

Continuum Mechanics

連続体力学

【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 attendance.

【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	
Matrices and tensors	1	
differential and integral calculus of tensors	1	
Kinematics	1	- Material derivative
Deformation and strain	2	- Strain tensors - Compatibility conditions
Stress and equilibrium equation	1	
Conservation law and governing equation	1	
Constitutive equation of idealized material	1	
Elastic-plastic behavior and constitutive equation of construction materials	1	
Boundary value problem	1	
Variational principle	1	
Various kinds of numerical analyses	2	
Confirmation of the attainment level of learning	1	

【Textbook】

【Textbook(supplemental)】

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

【Web Sites】

【Additional Information】

10F067

Structural Stability
構造安定論

【Code】10F067 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 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.

【Web Sites】none

【Additional Information】none

10F227

Structural Dynamics
構造ダイナミクス

【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

【Web Sites】

【Additional Information】

10C621

Applied Hybrid System Engineering

応用ハイブリッドシステム工学

【Code】10C621 【Course Year】Master Course 【Term】1st term 【Class day & Period】Wed 1st

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

【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.

【Web Sites】

【Additional Information】This course is held every two years.

10C601

Applied Mathematics for Electrical Engineering
電気数学特論

【Code】10C601 【Course Year】Master Course 【Term】1st term 【Class day & Period】Wed 1st 【Location】

【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	
	3	
	3	
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	4	Hamiltonian mechanics on linear symplectic space is lectured.
Manifold and vector field	3	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

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

【Additional Information】Appropriate references will be shown in classes.

10C612

Space Radio Engineering
宇宙電波工学

【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】Japanese

【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 reports

【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	6	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

【Textbook】

【Textbook(supplemental)】

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

【Web Sites】

【Additional Information】

10G017

Fracture Mechanics

破壊力学

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

【Location】Engineering Science Depts Bldg.-312 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Toru Ikeda

【Course Description】The basics of the fracture mechanics will be lectured.
Elastic problem, Airy's stress function, Stress function with complex number, Stress function of a crack, Stress field around a crack tip, Stress intensity factors, Energy release rate, J-integral, Cohesive model, Engineering applications of the fracture mechanics, Fatigue crack extension, Elastic plastic fracture mechanics, Interfacial fracture mechanics etc.

【Grading】Mini-reports at every lectures and the final report 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 the fracture mechanics at the conferences for the fracture mechanics.

【Course Topics】

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

【Textbook】The teacher provide articles for this lecture.

【Textbook(supplemental)】T. L. Anderson, Fracture Mechanics (Fundamentals and Applications) Second Edition, CRC Press Inc., ISBN 0-8493-4260-0, 1995

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

【Web Sites】

【Additional Information】

10G041

Advanced Finite Element Methods
有限要素法特論

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

【Location】Engineering Science Depts Bldg.-212 【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

【Web Sites】

【Additional Information】

10B418

Strength of Advanced Materials

先進材料強度論

【Code】10B418 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 2nd
【Location】Engineering Science Depts Bldg.-212 【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.
【Web Sites】
【Additional Information】The order and the item in the course are possibly subject to change.

10G230

Dynamics of Solids and Structures
動的固体力学

【Code】10G230 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 2nd

【Location】Bldg.No.11-Aeronautics 1 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture

【Language】Japanese 【Instructor】Shiro BIWA

【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, together with the influence of anisotropy, viscocity and nonlinearity. Plastic waves and impact strength of materials and structures are also considered.

【Grading】Grading will be 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	2	Expressions of stress and strain; Conservation laws; Hooke's law; Hamilton's principle, Love's theory for longitudinal waves in a bar.
Basics of wave propagation	2	One-dimensional wave equation; D'Alembert's solution; Harmonic waves; Spectral analysis; Waves in structural members; Dispersion; Phase and group velocities.
Waves in isotropic elastic media	1	Voigt notation of Hooke's law; Navier's equations; Longitudinal and transverse waves; Propagation of plane wave.
Waves in anisotropic elastic media	2	Stiffness matrix; Propagation of plane wave; Christoffel's equation; Propagation and polarization directions.
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	2	Bulk waves and guided waves; Rayleigh wave; Love wave; Lamb wave.
Elastic waves in real media	2	Effect of viscocity; Effect of nonlinearity; Effect of inhomogeneity; Scattering; Composite materials.
Response of materials and structures to impact loading	1	Plastic waves; Strain-rate dependence in plastic deformations; Impact strength of materials and structures.
Assessment of achievement	1	Assessment of achievement.

【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.

【Web Sites】

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

10Q607

Materials Strength at Elevated Temperatures
高温強度論

【Code】10Q607 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Fri 1st

【Location】Engineering Science Depts Bldg.-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
	1	
	1	
	2 − 3	
	2 − 3	
	2 − 3	
	1 − 2	
	1 − 2	
	1 − 2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10B622

Thermophysics for Thermal Engineering
熱物性論

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

【Location】Engineering Science Depts Bldg.-314 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】T. Makino and M. Matsumoto

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G039

Transport Phenomena

熱物質移動論

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

【Location】Engineering Science Depts Bldg.-212 【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)】

【Web Sites】

【Additional Information】

10G019

Molecular Fluid Dynamics
分子流体力学

【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】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	2	
	5	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G021

Engineering Optics and Spectroscopy
光物理工学

【Code】10G021 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 1st

【Location】Engineering Science Depts Bldg.-212 【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
	6	
	1	
	5	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10B628

Physics of Neutron Scattering
中性子物理工学

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

【Location】Engineering Science Depts Bldg.-312 【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
	13	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

High Energy Radiation Effects in Solid
高エネルギー材料工学

【Code】10B631 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 4th

【Location】Engineering Science Depts Bldg.-212 【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)】

【Web Sites】

【Additional Information】

10B634

Advanced Experimental Techniques and Analysis in Engineering Physics
先端物理工学実験法

【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)】

【Web Sites】

【Additional Information】

10B407

Robotics
ロボティクス

【Code】10B407 【Course Year】Master Course 【Term】2nd 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	
	4	
	1	
	3	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G023

Vibration and Noise Control

振動騒音制御

【Code】10G023 【Course Year】Master 1st 【Term】2nd term 【Class day & Period】Mon 1st

【Location】Engineering Science Depts Bldg.-213 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Hiroshi MATSUHISA, Hideo UTSUNO

【Course Description】Vibration and noise control of machines and structures are explained. Passive, active and semi-active vibration controls explained.

【Grading】Examination

【Course Goals】Understand the basic theories of vibration and sound control and be able to apply them to the actual problem.

【Course Topics】

Theme	Class number of times	Description
Passive vibration control	2	
Semi-active vibration control	2	
Active vibration control	2	
Modal Analysis	1	
Theory of sound	3	
Propagation of sound in outdoor field	2	
Indoor sound	1	
Technology of noise reduction	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G025

Mechanical Functional Device Engineering
メカ機能デバイス工学

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

【Location】Engineering Science Depts Bldg.-212 【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)】

【Web Sites】

【Additional Information】

10Q807

Theory for Design Systems Engineering

デザインシステム学

【Code】10Q807 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 3rd

【Location】Room 213, Butsurikei-Building 【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	
	1-2	
	1-2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10B828

High Precision Engineering

超精密工学

【Code】10B828 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 2nd 【Location】Engineering Science Depts Bldg.-216 【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

【Textbook】

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

【Prerequisite(s)】

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

【Additional Information】

10V003

Biomechanics

バイオメカニクス

【Code】10V003 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 3rd

【Location】Engineering Science Depts Bldg.-830 【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)】

【Web Sites】

【Additional Information】

10D450

Biomolecular Dynamics
生体分子動力学

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

【Location】Engineering Science Depts Bldg.-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
	2	
	2	
	2	
	3	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10B440

Environmental Fluid Dynamics

環境流体力学

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

【Location】Engineering Science Depts Bldg.-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**
	4	
	6	
	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10Q402

Turbulence Dynamics

乱流力学

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

【Location】Engineering Science Depts Bldg.-213 【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
	1	
	3	
	4	
	2	
	2	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G055

Crystallography of Metals
金属結晶学

【Code】10G055 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 4th

【Location】Engineering Science Depts Bldg.-212 【Credits】2 【Restriction】No Restriction

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10Q610

Seminar: Dynamics of Atomic Systems

原子系の動力学セミナー

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

【Location】Room 216 + Educational PC Room #1 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture + Exercise 【Language】Japanese

【Instructor】M. Matsumoto, R. Matsumoto, T. Shimada

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

【Grading】Reports

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Basics of MD simulations	4-5	- Numerical simulation of equations of motion - Model potentials - Data analysis - Equilibrium vs. non-equilibrium
Application: Thermofluidal systems	2-3	- Lennard-Jones fluids - Interface, phase change, energy transport, etc.
Application: Solid systems	2-3	- Deformation and destruction - Other methods
Application: Quantum systems	2-3	- First principle MD - Mechanical and electronic properties on nanoscale

【Textbook】

【Textbook(supplemental)】

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

【Web Sites】

【Additional Information】

10V007

Neutron Science Seminor 1

中性子材料工学セミナーＩ

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10V008

Neutron Science Seminar II

中性子材料工学セミナー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】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W025

Seminar on Applied Mechanics A

応用力学セミナー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)】

【Web Sites】

【Additional Information】

10W027

Seminar on Applied Mechanics B

応用力学セミナー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)】

【Web Sites】

【Additional Information】

10G029

Patent Seminar

特許セミナー

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

【Location】Engineering Science Depts Bldg.-212 【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)】

【Web Sites】

【Additional Information】

10G203

Micro Process and Material Engineering

マイクロプロセス・材料工学

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

【Location】Engineering Science Depts Bldg.-216 【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	2	
Soft-micromachining	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G205

Microsystem Engineering

マイクロシステム工学

【Code】10G205 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Mon 3rd

【Location】Engineering Science Depts Bldg.-216 【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".

【Web Sites】

【Additional Information】The student of this class is strongly recommended to take a course 10V201 "Introduction to the Design and Implementation of Micro-Systems", which is a practice for designing microsystem. Those who wants to take this course, please contact one of the instructors as early as possible.

10G209

Multi physics Numerical Analysis

マルチフィジクス数値解析力学

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

【Location】Engineering Science Depts Bldg.-101 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture

【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	2	
	5	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10B619

Quantum Theory of Condensed Matter
量子物性学

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

【Location】Engineering Science Depts Bldg.-212 【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	
	6	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G211

Solid State Physics 1

物性物理学 1

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

【Location】Engineering Science Depts Bldg.-214 【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	
	1 -2	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1-2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G214

Precision Measurement and Machining

精密計測加工学

【Code】10G214 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 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	
	3	
	3	
	4	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10V201

Introduction to the Design and Implementation of Micro-Systems

微小電気機械システム創製学

【Code】10V201 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 2nd

【Location】Engineering Science Depts Bldg.-216 【Credits】2

【Restriction】Take class 10G205 "Microsystem Engineering" 【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".

【Web Sites】

【Additional Information】The student of this class is required to take the course 10G205 "Microsystem Engineering", which provide the knowledge about the theory of sensing and actuating in microsystem. Those who wants to take this course have to take training course for CAD in advance. For more detail, please contact one of the instructors as early as possible.

10W603

Introduction to Biomedical Engineering
医工学基礎

【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)】

【Web Sites】

【Additional Information】

Quantum Theory of Molecular Physics
量子分子物理学特論

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

【Location】Engineering Science Depts Bldg.-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
	2	
	5	
	5	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10Q408

Quantum Theory of Chemical Physics

量子化学物理学特論

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

【Location】Engineering Science Depts Bldg.-212 【Credits】2 【Restriction】No Restriction

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	4	
	4	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Solid State Physics 2

物性物理学 2

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

【Location】Engineering Science Depts Bldg.-310 【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)】

【Web Sites】

【Additional Information】

10G423

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】Bldg.No.11-Aeronautics 2 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture

【Language】English 【Instructor】YOSHIDA Hideo, IWAI Hiroshi, SAITO Motohiro

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Fluid dynamics, Thermodynamics, Heat transfer

【Web Sites】

【Additional Information】

Jet Engine Engineering
ジェットエンジン工学

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

【Location】Engineering Science Depts Bldg.-212 【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	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G403

Optimum System Design Engineering
最適システム設計論

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

【Location】Engineering Science Depts Bldg.-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
	1	
	4	
	2	
	5	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G405

Propulsion Engineering, Adv.
推進工学特論

【Code】10G405 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 3rd

【Location】Bldg.No.11-Aeronautics 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	
	2	
	2	
	3	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G408

Hydrodynamic Stability Theory

流れの安定性理論

【Code】10G408 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 2nd

【Location】Bldg.No.11-Aeronautics 3 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture

【Language】Japanese 【Instructor】M. Nagata, T. Noguchi

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	5	
	5	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Aerospace Systems and Control
航空宇宙システム制御工学

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

【Location】Bldg.No.11-Aeronautics 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
	4	
	4	
	4	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G411

Fluid Dynamics for Aeronautics and Astronautics
航空宇宙流体力学

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

【Location】Bldg.No.11-Aeronautics 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	
	3	
	3	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C430

Advanced Flight Dynamics of Aerospace Vehicle
航空宇宙機力学特論

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

【Location】Bldg.No.11-Aeronautics 3 【Credits】2 【Restriction】【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Kei Senda

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

【Grading】Evaluation depends on marks of examination and exercises.

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

【Course Topics】

Theme	Class number of times	Description
Analytical Mechanics	6	1. Newton equations, 2. Lagrange equations, 3. Hamilton equations
Orbital Mechamics	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
Achievement Confirmation	1	Achievement Confirmation

【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)

【Web Sites】

【Additional Information】

10V401

Seminar on Engineering Science of Ionized Gases
電離気体工学セミナー

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

【Location】Bldg.No.11-Aeronautics 3 【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
	13	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10V010

Seminar on Molecular Gas Dynamics

分子流体力学セミナー

【Code】10V010 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Wed 3rd

【Location】Bldg.No.11-Aeronautics 3 【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)】

【Web Sites】

【Additional Information】

10V411

Seminar on Mathematical Fluid Mechanics
流体数理学セミナー

【Code】10V411 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Tue 3rd

【Location】Bldg.No.11-Aeronautics 3 【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)】

【Web Sites】

【Additional Information】

10V405

Seminar on Fluid Dynamics for Aeronautics and Astronutics
航空宇宙流体力学セミナー

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

【Location】Bldg.No.11-Aeronautics 3 【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)】

【Web Sites】

【Additional Information】

10R410

Seminar on Aerospace systems
航空宇宙機システムセミナー

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

【Credits】2 【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)】

【Web Sites】

【Additional Information】

10R419

Seminar on Systems and Control

システム制御工学セミナー

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

【Location】Bldg.No.11-Aeronautics 1 【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)】

【Web Sites】

【Additional Information】

10V407

Seminar on Optimum System Design Engineering

最適システム設計工学セミナー

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

【Location】Bldg.No.11-Aeronautics 3 【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)】

【Web Sites】

【Additional Information】

10V409

Thermal Engineering Seminar

熱工学セミナー

【Code】10V409 【Course Year】Doctor Course 【Term】1st 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)】

【Web Sites】

【Additional Information】

10V413

Seminar on Mechanics of Functional Solids and Structures

機能構造力学セミナー

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

【Location】Bldg.No.11-Aeronautics 2 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Seminar

【Language】Japanese 【Instructor】S. Biwa

【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 mechanical 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. Relevant papers are distributed.

【Textbook(supplemental)】

【Prerequisite(s)】Fundamental knowledge of solid mechanics is preferable.

【Web Sites】

【Additional Information】The time units of each stage are subject to change depending on each year's conditions.

Theory of Symbiotic Systems
共生システム論

【Code】693518 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Mon 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

693510

Control Theory for Mechanical Systems

機械システム制御論

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

693513

Theory of Human-Machine Systems

ヒューマン・マシンシステム論

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

693431

Dynamical Systems,Advanced
力学系理論特論

【Code】693431 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

693410

Mathematical Analysis,Advanced
数理解析特論

【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)】

【Web Sites】

【Additional Information】

693320

Topics in Nonlinear Dynamics A
非線形力学特論A

【Code】693320 【Course Year】Master and Doctor Course 【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)】

【Web Sites】

【Additional Information】

693321

Topics in Nonlinear Dynamics B
非線形力学特論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)】

【Web Sites】

【Additional Information】

653316

Heat Engine Systems

熱機関学

【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
	2	
	3	
	7	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

653322

Combustion Science and Engineering
燃焼理工学

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10M226

Meteorology I
気象学 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
	2～4	
	2～4	
	2～4	
	2～4	
	2～4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10M227

Meteorology II
気象学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
	3～4	
	3～4	
	3～4	
	3～4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C072

Introduction to Advanced Nuclear Engineering

基礎量子エネルギー工学

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

【Location】Bldg.No.1-Nuclear Engineering 1 【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)】

【Web Sites】

【Additional Information】

10C034

Nuclear Energy Conversion and Reactor Engineering
核エネルギー変換工学

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

【Location】Bldg.No.1-Nuclear Engineering 2 【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	
	2-3	
	3	
	3-4	
	2-3	
	3-4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C038

Physics of Fusion Plasma

核融合プラズマ工学

【Code】10C038 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 4th

【Location】Bldg.No.1-Nuclear Engineering 2 【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)】

【Web Sites】

【Additional Information】

10C037

Multiphase Flow Engineering and Its Application
混相流工学

【Code】10C037 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 2nd 【Location】Bldg.No.1-Nuclear Engineering 2 【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】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10R013

Nonlinear Physics in Fusion Plasmas

非線形プラズマ工学

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

【Location】Bldg.No.1-Nuclear Engineering Sminar Room 1 【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	
Nonlinear Waves in Plasmas	2	
Wave-Particle Interaction in Plasmas	2	
Wave-Wave Interaction in Plasmas	2	
Numerical Analysis of Differential Equations	4	
Numerical Simulation of Fusion Plasmas	3	
Assessment of Achievement	1	

【Textbook】None

【Textbook(supplemental)】

【Prerequisite(s)】Plasma Physics, Fundamental Magnetohydrodynamics, Fusion Plasma Physics

【Web Sites】

【Additional Information】

10F010

Bridge Engineering
橋梁工学

【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, Tomoaki Utsunomiya, Tomomi Yagi
【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 attendance.
【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.
【Web Sites】
【Additional Information】

10F009

Structural Design

構造デザイン

【Code】10F009 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Fri 2nd 【Location】C1-173

【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】English

【Instructor】Tomoaki Utsunomiya, Yoshikazu Takahashi, Yoshiaki Kubota

【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 structural morphology, aesthetics and case studies of structural design that satisfies “ utilitas, firmitas and venustas ” are given. Then we discuss what the holistic structural design should be.

【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 aesthetics of structures.

【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.
Modern Excellent Designs	1	The excellent examples of modern structural design are introduced from the viewpoint of the structural system and the urban design. Then the importance of integrated design of urban infrastructure as a place of human activities and how the design should be are lectured.
Structure and Form	2	The bridge types, for example, girder, truss, and arch etc. that have been regarded individually, are lectured as an integrated holistic concept from the viewpoint of the acting forces to understand the structural continuity, symmetry and the systems. Furthermore, the methods of the operation of structural form are given.
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 (for T. Utsunomiya)

【Textbook(supplemental)】U.Baus, M.Schleich, "Footbridges", Birkhauser, 2008（Japanese ver.: "Footbridges"(translated by Kubota, et al.), 鹿島出版会 , 2011）
久保田善明 , 『橋のディテール図鑑』, 鹿島出版会 , 2010
Other books will be given in the lectures as necessary.

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

【Web Sites】

【Additional Information】Structural planning and design will be given by Y. Takahashi, Excellent designs and structure & forms by Y. Kubota, and Structural reliability analysis by T. Utsunomiya.

Infrastructural Structure Engineering
社会基盤構造工学

【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 widelly 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.

【Web Sites】

【Additional Information】

10W005

Advanced Exercise in Applied Mechanics A

応用力学特別演習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)】

【Web Sites】

【Additional Information】

10W007

Advanced Exercise in Applied Mechanics B

応用力学特別演習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)】

【Web Sites】

【Additional Information】

10W009

Advanced Exercise in Applied Mechanics C

応用力学特別演習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)】

【Web Sites】

【Additional Information】

10W011

Advanced Exercise in Applied Mechanics D
応用力学特別演習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)】

【Web Sites】

【Additional Information】

10W013

Advanced Exercise in Applied Mechanics E

応用力学特別演習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)】

【Web Sites】

【Additional Information】

10W015

Advanced Exercise in Applied Mechanics F

応用力学特別演習 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)】

【Web Sites】

【Additional Information】

10W019

Internship M
インターンシップ M（応用力学）

【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)】

【Web Sites】

【Additional Information】

Internship DS

インターンシップ DS（応用力学）

【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)】

【Web Sites】

【Additional Information】

10W023

Internship DL

インターンシップ DL（応用力学）

【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)】

【Web Sites】

【Additional Information】

10V025

Seminar of Complex Mechanical Engineering,A

複雑系機械工学セミナーA

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

【Web Sites】

【Additional Information】All activities should be done in English.

10V027

Seminar of Complex Mechanical Engineering,B

複雑系機械工学セミナーＢ

【Code】10V027 【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)】

【Web Sites】

【Additional Information】All activities should be done in English.

Seminar of Complex Mechanical Engineering,C
複雑系機械工学セミナーC

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

【Web Sites】

【Additional Information】All activities should be done in English.

10V031

Seminar of Complex Mechanical Engineering,D

複雑系機械工学セミナーＤ

【Code】10V031 【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)】

【Web Sites】

【Additional Information】All activities should be done in English.

10V033

Seminar of Complex Mechanical Engineering,E

複雑系機械工学セミナーE

【Code】10V033 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Fri 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)】

【Web Sites】

【Additional Information】All activities should be done in English.

10V035

Seminar of Complex Mechanical Engineering,F
複雑系機械工学セミナー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)】

【Web Sites】

【Additional Information】All activities should be done in English.

10W017

Structural Testing Technology

構造工学実験法

【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
【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.
【Web Sites】
【Additional Information】

10V037

Advanced Experiment and Exercise in Applied Mechanics I, II
応用力学特別実験及び演習第一

【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)】

【Web Sites】

【Additional Information】

10V039

Advanced Experiment and Exercise in Applied Mechanics I, II

応用力学特別実験及び演習第二

【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)】

【Web Sites】

【Additional Information】

10F081

Infrastructure Creation Engineering

社会基盤工学創生

【Code】10F081 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Thu 4th 【Location】C1-192

【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】related teaching staff

【Course Description】A system of scientific principles and technologies is required which enable to create safe, reliable and vigourous human society with enough world-wide competitiveness. The class of Infrastructure Creation Engineering will lecture ongoing, retrospective and perspective on global environment, fundamental science/engineering, social science, social ecomonics and major scientific pronciples and technologies on natural environment including ecological system, which are needed to develop infrastructures.

【Grading】Grading will be based on reports (70%) and evaluation in each class (30%).

【Course Goals】It is aimed to make understand a system of scientific principles and technologies shich is required to create human society with sustainable development and to indicate their concept clearly. Major contents to create infrastructure as well as fundamental knowledge on its retrospective and perspective will be able to be learned.

【Course Topics】

Theme	Class number of times	Description
Role of geotechnics in sustainable infrastructure creation	2	
Role of hydro mechanics and water engineering in infrastructure creation and its evaluation	2	
Planning for infrastructure creation	2	
Subjects in material and structural engineering in rebuilding of infrastructure	2	
Role of earth resouses engineering for sustainable development in harmonious with environment	2	
Role of environmental engineering in infrastructure creation	2	
Thermal fliuid dynamics for fundamental understanding of global environmental subjects	2	
Confirmation of educational achievement	1	

【Textbook】None

【Textbook(supplemental)】To be introduced at any time

【Prerequisite(s)】It is desired to acquire basic knowledge on civil, environmental, eath resources and mechanical engineering.

【Web Sites】None

【Additional Information】To present in every class will be checked.

10W201

Developmental and Sustainable Infrastructure Engineering Seminar A

発展的持続性社会基盤工学セミナー 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W203

Developmental and Sustainable Infrastructure Engineering Seminar B

発展的持続性社会基盤工学セミナー 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W001

Infrastructural Structure Engineering

社会基盤構造工学

【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 widelly 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.

【Web Sites】

【Additional Information】

10F065

Hydraulic Engineering for Infrastructure Development and Management
水域社会基盤学

【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】Shiiba Michiharu, Hosoda Takashi, Gotoh Hitoshi, Tachikawa Yasuto, Kisihida Kiyoshi, Harada Eiji, Sanjou Michio 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.
Turbulence phenomena in open-channel flows	3	Several problems and exciting topics related to turbulence phenomena 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.
Exercise	2	The exercises to the given subjects are performed.

【Textbook】Non

【Textbook(supplemental)】Non

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

【Web Sites】Non

【Additional Information】Non

10F057

Principles of Geotechnics
地盤工学原論

【Code】10F057 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 1st

【Location】C1-173 【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	
	6	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Infrastrucuture Planning

社会基盤計画学

【Code】10W207 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 5th

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

【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10A402

Resources Development Systems

資源開発システム工学

【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】T. Matsuoka, S. Murata

【Course Description】Development of mineral resources and energy resources is essential to the sustainable development of our society and economy. In this class, the exploration and development process of such the natural resources is overviewed including the environmental conservation and harmony. In addition, petrophysics dealing with the basic physical properties of rocks and its application to the resources exploration, fundamentals and applications reservoir engineering used to evaluate the production behavior and reserves of oil and natural gas are lectured.

【Grading】Evaluation is evenly made by the 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 that are needed to evaluate the amount of recoverable oil and natural gas reserves and the behavior of the reservoir fluids in the exploration and development of oil and natural gas

【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 and economy, is overviewed including the environmental conservation and harmony.
Petrophysics used in natural resources development	6	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	4	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	2	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

【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

10F439

Environmental Risk Analysis

環境リスク学

【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】Japanese

【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G403

Optimum System Design Engineering
最適システム設計論

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

【Location】Engineering Science Depts Bldg.-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
	1	
	4	
	2	
	5	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W209

Developmental and Sustainable Infrastructure Internship A

発展的持続性社会基盤工学 ORT・インターンシップ 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)】

【Web Sites】

【Additional Information】

10W211

Developmental and Sustainable Infrastructure Internship B

発展的持続性社会基盤工学 ORT・インターンシップ 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)】

【Web Sites】

【Additional Information】

10W213

Developmental and Sustainable Infrastructure Engineering Seminar I

発展的持続性社会基盤工学演習 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W215

Developmental and Sustainable Infrastructure Engineering Seminar II

発展的持続性社会基盤工学演習 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F003

Continuum Mechanics
連続体力学

【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 attendance.

【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	
Matrices and tensors	1	
differential and integral calculus of tensors	1	
Kinematics	1	- Material derivative
Deformation and strain	2	- Strain tensors - Compatibility conditions
Stress and equilibrium equation	1	
Conservation law and governing equation	1	
Constitutive equation of idealized material	1	
Elastic-plastic behavior and constitutive equation of construction materials	1	
Boundary value problem	1	
Variational principle	1	
Various kinds of numerical analyses	2	
Confirmation of the attainment level of learning	1	

【Textbook】

【Textbook(supplemental)】

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

【Web Sites】

【Additional Information】

10F067

Structural Stability

構造安定論

【Code】10F067 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 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.

【Web Sites】none

【Additional Information】none

10F068

Material and Structural System & Management

材料・構造マネジメント論

【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】Toyoaki Miyagawa, 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 structure's 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.
【Web Sites】
【Additional Information】Positive presence in the lecture is expected by joining discussions for example.

10F011

Computational Fluid Dynamics

数値流体力学

【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】Hiromichi Shirato, Satoru Ushijima

【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 discrete vortex 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
Introduction	1	Introduction of recent examples of CFD
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.
unsteady viscous flow around bluff body by surface vorticity method	7	The surface vorticity method is introduced as one of the effective method which can solve an unsteady separating flow from an edge and its reattachment to a body. The mesh- and pressure-free concept in this method is introduced, which can be applied various flow phenomena including unsteady separation. SOme special treatment such as how to introduce the viscosity (core spreading, random walk) and how to evaluate surface pressure distribution will be explained. Design of airfoil geometry is also introduced as one of application of the method.

【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

【Web Sites】

【Additional Information】

10F227

Structural Dynamics
構造ダイナミクス

【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

【Web Sites】

【Additional Information】

Earthquake Engineering/Lifeline Engineering

地震・ライフライン工学

【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, Koike (T), 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 design of RC and steel structures
Seimisc response contorl 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)】

【Web Sites】

【Additional Information】

10F263

Seismic Engineering Exercise

サイスミックシミュレーション

【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
【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.
	1	

【Textbook】Not used; Class hand-outs are distributed when necessary.
【Textbook(supplemental)】
【Prerequisite(s)】Earthquake Engineering/Lifeline Engineering (10F261), Structural Dynamics (10F227)
【Web Sites】
【Additional Information】

Hydraulics & Turbulence Mechanics
水理乱流力学

【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
	15	

【Textbook】

【Textbook(supplemental)】Nezu, I. and Nakagawa, H. : Turbulence in Open-Channel Flows, Balkema,

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F466

Basin Environmental Disaster Mitigation
流域環境防災学

【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)】

【Web Sites】

【Additional Information】

10F077

River basin management of flood and sediment
流域治水砂防学

【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

【Web Sites】

【Additional Information】

10F019

River Engineering and River Basin Management

河川マネジメント工学

【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
【Course Description】It is important to consider about rivers comprehensively in view of the various aspects based on natural science and engineering. The fundamental knowledge to consider rivers and make the plans of 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, ecological system of rivers and lakes, flood disasters, integrated river basin planning(flood defense, environmental improvement planning, sediment transport system), functions of dam reservoir and managementto learn the fundamental knowledge and grounding to consider rivers from the various points of view such as natural science, engineering and social science.
【Grading】Reports, Attendance
【Course Goals】The fundamental knowledge which can consider a river with various senses from a viewpoint of natural science, an engineering viewpoint and a social-scientific viewpoint, is mastered.
【Course Topics】

Theme	Class number of times	Description
Various view points on rivers and river basins	1	Various viewpoints 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	Fundamental knowledge on river eco-system
Application of computational methods to environmental problems	2	Numerical analysis of the environmental change in Lake Biwa, Flood flows and river channel processes
Recent flood disasters & Integrated river basin planning	2	Characteristics of recent flood disasters, River law, Fundamental river management plan, River improvement plan, Procedures of flood defense 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
Water quality of reservoir	1	Environmental fluid behavior on reservoir, Water quality and its maintenance of reservoir
Economic evaluation of environmental improvement projects	1	Evaluation of people's consciousness for river improvement works by means of CVM, Conjoint Analysis, etc.
Dam structure and maintenance	1	Dam structure, foundation, grouting, and maintenance
Special Lecture	1	Expert engineer and/or office on the river Engineering and river basin management will be invited.

【Textbook】Printed materials regarding the contents of this class are distributed in class.
【Textbook(supplemental)】
【Prerequisite(s)】Fundamental knowledge of Hydraulics, Hydrology and Ecology
【Web Sites】
【Additional Information】Students can contact with professors by visiting their rooms and sending e-mail.
Prof. Hosoda: hosoda.takashi.4w@kyoto-u.ac.jp
Assoc. Prof. Kishida: kishida.kiyoshi.3r@kyoto-u.ac.jp

10A040

Sediment Hydraulics

流砂水理学

【Code】10A040 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 2nd 【Location】C1-171 【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.

【Web Sites】Non

【Additional Information】Non

10F462

Coastal Wave Dynamics
海岸波動論

【Code】10F462 【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】Hitoshi Gotoh, Eiji Harada, Khayyer Abbas and Kazuya Oki

【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 usual students activities in lectures and reports.

【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	7	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.

【Textbook】Non

【Textbook(supplemental)】Non

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

【Web Sites】

【Additional Information】If there are any questions, please send e-mail to the staff. This course will not be offering in 2012.

10A216

Hydrology
水文学

【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】Michiharu SHIIBA and Yasuto TACHIKAWA
【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, groundwater 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, distributed hydrological modeling which incorporate various hydrological processes and a lumping method of distributed hydrological model are explained.
【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.
Saturated-unsaturated subsurface flow	2	The physical process of the saturated-unsaturated subsurface flow and its numerical modeling method are described. The basic equations of the saturated-unsaturated subsurface flow and the numerical simulation methods are explained.
Groundwater flow	2	The physical process of the groundwater flow and its numerical modeling method are described. The basic equations of the groundwater 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.
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.
Channel network and watershed modeling	1	Numerical representations of channel networks and catchments are explained.
Distributed hydrological model	1	A physically-based distributed hydrological model is described, which is constructed with numerical representations of channel networks and catchments.
Lumping of flow, parameter and watershed model	1	Lumping methods of a distributed hydrological model are described, which include lumping of flow, parameter and watershed model.
verification of study achievement	1	Verification of study achievement

【Textbook】Handouts are distributed at each class.
【Textbook(supplemental)】
【Prerequisite(s)】Basic knowledge of hydraulics and hydrology
【Web Sites】http://hywr.kuciv.kyoto-u.ac.jp/lecture/lecture.html
【Additional Information】

10F464

Hydrologic Design and Management
水工計画学

【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】Michiharu SHIIBA, Yasuto TACHIKAWA and Sunmin KIM
【Course Description】Methods for hydrologic design and real-time rainfall-runoff predictions are described. The frequency analysis of hydrologic extreme values and the time series analysis of hydrologic variables are described, and then the methods to set the external force for the hydrologic design are explained. Next, a physically based hydrologic model which includes the process of human activities for the hydrologic cycle is described. In addition, the predictive uncertainty for the hydrologic simulation is introduced. A flood control planning and water resources management with the use of innovative hydrologic simulation tools is described. Then, the climate change and the relation to the hydrologic design are discussed. A real-time rainfall runoff prediction method with the use of Kalman filter theory is described.
【Grading】Examination and report
【Course Goals】The class aims to understand the statistical analysis and time serried analysis of hydrologic variables to set 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	2	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	3	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	1	A hydrologic modeling system which helps to develop complicated hydrologic simulation models and its importance for a flood control planning is also described.
Climate change and hydrologic design	2	Data analysis of the latest GCM simulation is presented and the possible changes of hydrologic extremes and hydrologic design are discussed.
Real-time rainfall runoff prediction	3	A real-time rainfall runoff prediction method with the use of Kalman filter theory is described.
Verification of study achievement	1	Verification of study achievement is conducted.

【Textbook】Handouts are distributed at each class.
【Textbook(supplemental)】
【Prerequisite(s)】Basic knowledge of hydrology, probability and statistics are required.
【Web Sites】http://hywr.kuciv.kyoto-u.ac.jp/lecture/lecture.html
【Additional Information】

10A222

Water Resources Systems

水資源システム論

【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.(DPTI) 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.

【Web Sites】

【Additional Information】Open every two years. Not available in 2012.

10F269

Coastal and Urban Water Disasters Engineering
沿岸・都市防災工学

【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】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F267

Hydro-Meteorologically Based Disaster Prevention

水文気象防災学

【Code】10F267 【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】Japanese

【Instructor】

【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)】

【Web Sites】

【Additional Information】

10F441

Water Quality Engineering
水環境工学

【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】Hiroshi TSUNO, Hiroaki TANAKA, Fumitake NISHIMURA

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Open Channel Hydraulics

開水路の水理学

【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

【Course Description】Fundamental theory of Open Channel Hydraulics used in River Engineering and Urban Fluid Engineering Fields are lectured, showing various applications in Hydraulic Engineering Field. The contents include the following items: Application of singular point theory to water surface profile analysis, Derivation of 2-D depth averaged model, 1-D analysis of unsteady open channel flows, Plane 2-D analysis of steady high velocity flows, Plance 2-D analysis of unsteady flows, Higher order theory, etc.

【Grading】Regular examination

【Course Goals】to understand the grounds of Open Channel Hydraulics and to learn how to apply Open Channel Hydraulics to practical problems in hydraulic engineering field.

【Course Topics】

Theme	Class number of times	Description
Guidance	1	The outline of this class is introduced by overviewing the whole framework of Open Channel Hydraulics with various computational results.
Derivation of 2-D depth averaged model	1	Derivation procesures of plane 2-D depth averaged model are expalined in detail
Application of singular point theory to water surface profile analysis	1	
1-D analysis of unsteady open channel flows	3	Fundamental characteristics of 1-D unsteady open channel flows, Method of Characteristics, Dam break flow, Computational methods
Fundamentals of numerical simulation	1	Considering the convective equation as an example, fundamental knowledge of numerical simulation is explained by means of finite difference method, finite element method, etc. Applications these method to unsteady open channel flows are also shown with some practical applications.
Plane 2-D analysis of steady high velocity flows	1	Characteristics of steady plane 2-D flow are explained based on the method of characteristics.
Plance 2-D analysis of unsteady flows	3	Propagation of characteristic furface, shear layer instability, application of a generalized curvilinear coordinate to river flow computation, application of a moving coordinate system, etc.
Higher order theory	3	Boussinesq equation with the effect of vertical acceleration, full/partially full pressurized flow onserved in sewer network, trafic flow analysis by means of dynamic wave model
Examination of understanding	1	The understanding of the contents is examined through the paper examination.

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

【Textbook(supplemental)】

【Prerequisite(s)】Elementary knowledge of fluid dyanamics and hydraulics

【Web Sites】

【Additional Information】Students can contact with Hosoda by sending e-mail to hosoda.takashi.4w@kyoto-u.ac.jp This class is open in 2012.

10F100

Applied Hydrology
応用水文学

【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】Tomoharu Hori, Tetsuya Sumi, Yoshitaka Kido, Yasuhiro Takemon, Kenji Tanaka

【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 Resources Systems	3	Interaction between water resources and socio-economic systems, Distributed flood risk assessment and countermeasures design from human security viewpoint
Reservoir Systems and Sustainability	3	Reservoir system and its environmental impacts, Sustainable management of reservoir system
Land Surface Proceses	2	Modelling of land surface processes, Application of land surface model
Water Quality Management	2	Diffuse pollution control, Water quality management of enclosed lake and groundwater
Hydro-eco Systems	2	Ecohydrological management of habitats in river ecosystems, Ecohydrological management of biodiversity in wetland ecosystems
Presentation and Discussion	2	Presentation and Discussion on related topics
Examination	1	

【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.

【Web Sites】

【Additional Information】

10F103

Case Studies Harmonizing Disaster Management and Environment Conservation

環境防災生存科学

【Code】10F103 【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)】Relay Lecture 【Language】English

【Instructor】K. TAKARA(DPRI), H. NAKAGAWA(DPRI), E. NAKAKITA(DPRI), H. MASE(DPRI), N. MORI(DPRI), Y. YAMASHIKI(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	2	River environment and disaster management
The environment of closed water areas / Atmosphere-ocean climate interaction	2	The environment of closed water areas / Atmosphere-ocean climate interaction
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.

【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.

【Web Sites】

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

10F106

Integrated Disasters and Resources Management in Watersheds

流域管理工学

【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】Keiichi TODA(DPRI), Masaharu FUJITA(DPRI), Tetsuya HIRAISHI(DPRI), Nozomu YONEYAMA(DPRI), Kenji KAWAIKE(DPRI), Hiroshi TAKEBAYASHI(DPRI), Daizo TSUTSUMI(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
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)	集中２日間	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)	集中２日間	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)	集中２日間	The Sirahama Maritime Observatory is located in Wakayama Prefecture. In the lecture, observatory, waves, currents and tide levels monitoring system is demonstrated.

【Textbook】None

【Textbook(supplemental)】None

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

【Web Sites】

【Additional Information】

10F023

Numerical Methods in Geomechanics
地盤数値解析法

【Code】10F023 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Thu 1st

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

【Instructor】Fusao Oka, Sayuri Kimoto

【Course Description】Numerical methods for the problems of geoengineering, e.g., infiltration, transportation, consolidation, dynamic problems, progressive failure, and excavation, will be introduced in this lecture. Finite element analysis, difference method, boundary element method, and distinct element method, will be covered.

【Grading】Final examination, attendance

【Course Goals】The objectives of this course are to understand the fundamentals of numerical analysis method for geoengineering and its application.

【Course Topics】

Theme	Class number of times	Description
Numerical methods for differential equations	5	Outlines, Numerical methods for geoengineering Numerical methods for differential equations, Stability of differential equations Difference method
Finite element method	5	Virtual work theorem Finite element method, Isoparametric element, Stiffness matrix, stress and strain
Numerical methods for multiphase materials	3	Governing equation of two phase mixture material, Finite element method for two phase mixture material, Consolidation analysis, Numerical methods for heat conduction equation
Other numerical methos	1	Boundary element method, Material point method, Distinct element method, Smoothed particle hydrodynamics method
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F025

Geomechanics

地盤力学

【Code】10F025 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 3rd

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

【Instructor】Fusao Oka, Sayuri Kimoto

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

【Grading】Final examination and several papers

【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	2	Mechanical property of geomaterials, Critical state soil mechanics, Failure criteria, Effective stress, Suction
elasto-plastic constitutive model	3	Constitutive model for geomaterials, Elasto-plastic model, Cam clay model
Theory of viscosity and viscoplasticity	4	Viscoelasticity, viscoplasticity, Elasto-viscoplastic mode, Adachi-Oka model, Microstructure of soils, Temperature dependent behavior, Applications of constitutive models
Consolidation analysis	3	Biot's consolidation theory and its application, Consolidation of embankment
Liquefaction of soils	2	Liquefaction of sandy soil, Damage and failure due to liquefaction, Remedial measures for liquefaction
Confirmation of achievement	1	

【Textbook】Soil mechanics, Fusao Oka, Asakura Publishing (in Japaneses)
An elasto-viscoplastic constitutive model, Fusao Oka, Morikita Publishing (in Japanese)

【Textbook(supplemental)】

【Prerequisite(s)】Soil mechanics, Fundamentals of continuum mechanics

【Web Sites】

【Additional Information】

10K016

Computational Geotechnics

計算地盤工学

【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】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F237

Management of Geotechnical Infrastructures
ジオマネジメント工学

【Code】10F237 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Tue 4th

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

【Instructor】Ohtsu, Kishida, Shiotani

【Course Description】Advanced monitoring and management techniques not only during construction stage but maintenance stage in geo- or rock-infrastructures are lectured systematically.

【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
Geotechnical survey	5	Introduction of geotechnical survey, Geophysical exploration, Inversion technique, Practical works of field measurements
Probability theory	4	B/C on project, Project risk management, Basic of probability theory, Introduction of contract and Int'l construction project
Innovative monitoring techniques	4	Applications of geo and rock monitoring, Advanced NDT, Applications of cutting-edge fields
	1	

【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)】

【Web Sites】

【Additional Information】Addtional information is available by visiting the following professors. Appointment shall be made in advance by e-mail.
Ohtsu@toshi.kuciv.kyoto-u.ac.jp
kishida.kiyoshi.3r@kyoto-u.ac.jp
shiotani.tomoki.2v@kyoto-u.ac.jp

Fundamental Geofront Engineering
ジオフロント工学原論

【Code】10F405 【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】English 【Instructor】M.Mimura,S.Nishiyama,T.Koyama,K.Ando

【Course Description】This lecture aims to learn a practical knowledge associated with mechanical and hydraulic problems in rock masses to realize environment-friendly development of underground space through exercise in modelling and analytical study of rock mass.

【Grading】Problem sets will be given almost every week and due one week later in class. You can work together but must turn in your own solutions.

【Course Goals】This course is designed to give students knowledge and understanding to recognise and apply the fundamental techniques used in engineering rock mechanics for the analysis of underground engineered structures.

【Course Topics】

Theme	Class number of times	Description
Introduction to rock mechanics and rock engineering	1	Introduction to common geophysical investigation methods and field investigation methodology.
Rock mass behaviour around excavations	2	How to apply popular failure criteria to determine the strength of both intact rock and discontinuities. How to assess the geometry of discontinuous rock masses using customary measures and techniques
Rock strength and rock mass classification	2	Rock construction techniques for rock foundation works and also for construction of rock caverns and tunnels. Proposals for support of strength and running of construction works in rocks based on conceptual engineering geological models, assessment of the Q-value and of the mechanical characteristics of the rock mass.
Underground excavations in discontinuous and stratified rock	2	Basic rock geology emphasizing characteristics of rocks, in particular structural features and the importance of discontinuities in rock construction works.
Computer methods in rock mechanics and rock engineering:	3	Introduction to computer programmes for underground space design, rock mechanics, and environmental control.
Hydrogeology and groundwater flow in geotechnical	2	The influence of the groundwater conditions on the characteristics of the rock mass, in particular concerning strength and stability but also rock construction technique and environmental consequences.
Risk assessment and risk management	3	Risk assessment processes in rock engineering and management principles with respect to the environment.

【Textbook】Handout will be distributed.

【Textbook(supplemental)】References are indicated in the handout.

【Prerequisite(s)】Undergraduate courses in geology, geotechnical engineering,and soil mechanics.

【Web Sites】

【Additional Information】

10F407

Environmental Design in Geo-front Engineering
ジオフロント環境デザイン

【Code】10F407 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 2nd

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

【Instructor】M.Mimura,S.Nishiyama,T.Koyama,Y.Ijiri

【Course Description】Practical projects of geo-risk management, advanced measurement method and groundwater environmental-assessment system associaeted with utilization and environmental conservation of underground space are introduced and explained in this lecture.

【Grading】Problem sets will be given almost every week and due one week later in class.
You can work together but turn in your own solutions.

【Course Goals】This course is intended to give students a basic understanding of the theoretical and empirical principles of underground spacce development.
This course will provide the analytical background for students to understand the design principles used in disposal of radioactive Waste project and subsurface CO2 disposal project.

【Course Topics】

Theme	Class number of times	Description
Introduction to underground development	1	Introduction to rock mechanics and rock engineering.
Rock mechanics for underground development	2	Fundamental definitions, historical underground development, underground development art and engineering.
Construction of underground structures	3	Influence of rock strength on excavation, influence of undeground space size, ground support drilling and blasting, mechanism of rock breakage, tunnelling progress with drill and blast excavation.
Hydraulic engineering in underground development	4	Geologic formation as aquifers, , groundwater flow in unsaturated zones and fractured media, hydro-geologic investigation, 3-D general flow equations and advection diffusion equation, groundwater modeling, etc.
Geo-risk engineering	3	Risk identification, risk qualification analysis, risk response, and topics in risk engineering.
Examples of underground development projects	2	Study on underground-space use and construction case studies.

【Textbook】Handout will be distributed.

【Textbook(supplemental)】References are indicated in the handout.

【Prerequisite(s)】Undergraduate courses in geology, geotechnical engineering, and soil mechanics.

【Web Sites】

【Additional Information】

10F203

Public Finance
公共財政論

【Code】10F203 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 3rd

【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	
GNP and Social Accounting	2	
AD-AS Model	3	
IS-LM Model	2	
Monetary Policies	2	
International Economics	2	
Economic Growth Model	2	
Summary	1	Summarize classes and check whether students could understand them.

【Textbook】

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

【Prerequisite(s)】Basic Microeconomics

【Web Sites】will be notified in the first class.

【Additional Information】

10F207

Urban Environmental Policy

都市社会環境論

【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

【Web Sites】

【Additional Information】

10F213

City Logistics

シティロジスティクス

【Code】10F213 【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】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?	1	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	1	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	1	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	1	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	1	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	1	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	1	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	1	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).

【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.

【Prerequisite(s)】Linear programming, optimisation, queueing theory

【Web Sites】

【Additional Information】

10F215

Intelligent Transportation Systems
交通情報工学

【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 and T. Yamada
【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)】
【Web Sites】
【Additional Information】

Quantitative Methods for Behavioral Analysis
人間行動学

【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】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F223

Risk Management Theory

リスクマネジメント論

【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

【Web Sites】

【Additional Information】

10A806

Advanced Geoinformatics

空間情報論

【Code】10A806 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Tue 2nd 【Location】C1-172 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture & Exercise 【Language】Japanese 【Instructor】Masayuki Tamura, 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 home works given in every lesson.

【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	1	1. Introduction to remote sensing 2. Applications in environmental and disaster prevention fields
Classification of electromagnetic waves and satellite sensors	1	1. Classification of electromagnetic waves 2. Basic terms on electromagnetic radiation 3. Theory of electromagnetic radiation from objects 4. Classification of satellite sensors by observation wavelengths
Interaction of electromagnetic waves with earth surfaces	1	1. Reflection and scattering of electromagnetic waves by earth surfaces 1.1 Bidirectional reflectance distribution function 1.2 Bidirectional reflectance factor 2. Spectral reflectance properties of earth surfaces and objects
Atmospheric effects on satellite observations	1	1. Absorption and scattering of electromagnetic waves by atmospheric particles 2. Atmospheric radiative transfer of electromagnetic waves 3. Atmospheric effects on satellite observations 4. Correction of atmospheric effects
Optical sensors	1	1. Principles of visible and reflective infrared sensors 2. Examples of visible and reflective infrared sensors 3. Applications of reflective infrared sensors
Thermal infrared sensors	1	1. Principles of thermal infrared sensors 2. Measurements of surface temperature by satellite sensors 3. Examples of thermal infrared sensors 4. Applications of thermal infrared sensors
Image processing 1 (Image correction)	1	1. Image processing procedure 2. Image enhancement 3. Image correction 4. Correction of geometrical distortion
Image processing 2 (Image classification)	1	1. What is image classification? 2. Theory of image classification 3. Classification rules 4. Image classification procedure
Microwave sensors	2	1. Microwave 2. Microwave sensors 3. Real Aperture Radar (RAR) 4. Synthetic Aperture Radar (SAR) 5. Interferometric SAR 6. Differential Interferometric SAR
	1	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】・ W. G. Rees 著，Physical Principles of Remote Sensing 2nd ed., Cambridge University Press
・ J. A. Richards 著，Remote Sensing Digital Image Analysis: An Introduction, Springer-Verlag
・日本リモートセンシング研究会編，図解リモートセンシング，日本測量協会
・ Fundamentals of Remote Sensing: A Tutorial by the Canada Center for Remote Sensing（http://ccrs.nrcan.gc.ca/resource/tutor/fundam/index$_e$.php）

【Prerequisite(s)】Basic knowledge in computer information processing

【Web Sites】

【Additional Information】

10A808

Civic and Landscape Design

景観デザイン論

【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, Shojiro Hara

【Course Description】

【Grading】Reports (Kawasaki: 30%, Yamaguchi: 10%), Participation in discussions (Kubota: 10%), and design practice (Hara: 50%)

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Guidance. Landscape and image	1	
Design of streets	1	
Design of parks	1	
Design of waterfronts	1	
Design of stations	1	
Various aspects of landscape research	1	
Design of Urban landscape	2	
Design Management	2	
Design practice	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Computational Mechanics and Simulation

計算力学及びシミュレーション

【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】Gotoh, Murata, Furukawa, Liang

【Course Description】The process to obtain numerical solutions for various problems in compuational mechanics. Descretization and some solvinng technique for initial/boundary value problems is to be introdeced by the FEM, FDM, VM and PM with programming exercises. 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 application 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.Current technology of the particle method by is to be explained on the violent flow phenomena with free surface. The prticular subjects in PM such as mometum conservation and convection of pressure disturbance by numerical instability, etc. will be inntroduced. 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
Homogenization technique and FEM	4	Homogenization method with FEM will be lectured in this item. It is used for obtaining the equivalent homogenized material constants of an anisotropic composit material to be analyzed. The method to obtain homogenized elastic coefficient tensor will be especially focused on.
Molecular dynamics simulation	4	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 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.
Free surface flow analysis by particle method	3	Current technology of the particle method by is to be explained on the violent flow phenomena with free surface. The prticular subjects in PM such as mometum conservation and convection of pressure disturbance by numerical instability, etc. will be inntroduced.

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F069

Modelling of Geology

数理地質学

【Code】10F069 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 2nd

【Location】C1-173 【Credits】2

【Restriction】should have unit(s) of an introductory lecture on earth science (i.e. Introduction to Earth Science) and/or earth resources engineering

【Lecture Form(s)】Leture, excercises, field excursions 【Language】Japanese or English (change every year)

【Instructor】Yasuhiro YAMADA

【Course Description】This lecture is on modelling of a geology phenomenon which becomes indispensable when carrying out underground-resources development. First of all, the lecture tells that geologic phenomena are complicated as a fundamental posture and mathematical analysis is possible only a part of them. Then, a various analysis techniques and the analysis example are explained with the basic theory for simplifying the natural phenomena to construct geologic models. Then, field excursions are carried out to see relation between topography and local geology. During the excursions, students learn the conditions and assumptions which are needed to model complicated phenomena in which two or more factors involve. The phenomenon in which modelling is possible is limited to a few part.

【Grading】Based on the reports on the lectures and field excursions.

【Course Goals】Students understand the scope of this lecture, the complexity of natural phenomena and our limited knowledge on them, and can explain the contents to others.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Theme, lecture / excursion schedule, evaluation etc
modelling theory	2	basic theory on geologic modelling
methods and examples	6	methods of geologic modelling and examples are explained with exercises.
excursion 1	4	excursion to NE Kyoto basin to see the relation between topography and geology, in term of an active fault
excursion 2	2	excursion to SW Kyoto basin to see the relation between topography and geology, in term of a relatively inactive fault

【Textbook】no textbook. appropriate articles will be provided.

【Textbook(supplemental)】appropriate books will be informed, this may include ones on geologic modelling.

【Prerequisite(s)】basic knowledge on earth science, including skills to read geologic and geography maps, required.

【Web Sites】

【Additional Information】this lecture includes field excursions. the dates will be determined during the first class, thus all applicants have to attend this class.

10F071

Applied Elasticity for Rock Mechanics
応用弾性学

【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, design and management of rock structures such as tunnel, underground cavern, and rock slope is explained. More specifically, two-dimensional and three-dimensional analysis of elasticity using the basic elastic equations, constitutive equations, and the complex stress function are explained. Several applications of the elasticity to rock mechanics, rock engineering, and fracture mechanics are also explained by deriving their solution.

【Grading】Evaluation is made by the score of two report problems 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 the 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 solution.
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	3	Stress functions to solve the three-dimensional elastic problem are explained, and some examples of the three-dimensional elasticity solution derived by using the stress functions are explained.

【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)】It is desirable to have knowledge of calculus, vector analysis and complex analysis.

【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

10F073

Fundamental Theories in Geophysical Exploration

物理探査の基礎数理

【Code】10F073 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Fri 3rd 【Location】C1-171 【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	2~3	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	2~3	Discussing fundamental theories of elastic wave propagation, used in subsurface structural surveys, in terms of the actual utilization and the theories of wave phenomena.
Attenuation of seismic waves	1~2	The attenuation of seismic waves are discussed in terms of the origin of intrinsic friction, theoretical background satisfying the causality, and the recovery of attenuation effects.
Seismic waves and petrophysical properties	1	Discussing materials composing earth's crust or mantle and porous rocks in which seismic waves travel through, to understand various geophysical exploration methodologies using seismic waves.

【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.

【Web Sites】Could be specified by the lecturers if any.

【Additional Information】

10F039

Time Series Analysis

時系列解析

【Code】10F039 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 4th

【Location】C1-172 【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	
	1	
	2	
	2	
	1	
	2	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10A405

Environmental Geosphere Engineering

地殻環境工学

【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】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F086

Energy System Management

エネルギー基盤マネジメント工学

【Code】10F086 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 2nd 【Location】C1-171
【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】English 【Instructor】Katsuaki Koike
【Course Description】Securance and develpment harmonious with natural environments of the mineral and fossil energey resources, and utilization of storage function of geologic strata have become important issues for consructing ssustainable society. This subject introduces comprehensively the present situation of uses of mineral and energy resources, crust structure and dynamics, economic geology for the genesis and geologic envisonments of deposits, physical and chemical exploration methods of marine deposits, mathematical geology for reserve assessment, engineering geology for resource development and geological repository, and problems and promisingness of natural energy such as geothermal, solar, wind, and tide.
【Grading】Integrated evaluation by attendance to the classes and report grades
【Course Goals】To find out directionality about the technologies required for constructing sustainable society by yourself with full understandings of genetic mecanism, biased distribution, and the present situation of demand and supply of the mineral and energy resources.
【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1.5	
Introduction of mineral resources	1.5	Classification of minerals used for resources, recent trend on social demand of mineral resources, industrial uses of each mineral, and sustainability.
Introduction of Energy resources	1	Classification of energy sources, recent trend on social demand of energy, physical characteristics of each energy resources, and sustainability.
Physical and chemical properties of crust	1	Inner structure of the Earth, geodynamics, geologic composition, temperature structure, rock physics, and chemical composition of crust.
Economic geology (1)	1	Classification of ore deposits, distribution of each type of ore deposit, generation mechanism of deposit.
Economic geology (2)	1	General structure and distribution of fuel deposits (coal, petroleum, and natural gas), generation mechanism of deposits, and geological process of formation.
Resource exploration (1)	1	Physical and chemical exploration technologies for natural resources in terrestrial area. Representative methods are remote sensing, electric sounding, electromagnetic survey, and seismic prospecting.
Resource exploration (2)	1	Introduction of marine natural resources such as methane hydrate, cobalt-rich crust, and manganese nodule, and exploration technologies for the deposits in sea area.
Assessment of ore reserves and reservoir characterization	1	Fundamentals of geostatistics, variography for spatial correlation structure, spatial modeling by kriging, geostatistical simulation, integration of hard and soft data, and feasibility study
Resource development (1)	1	Development and management technologies of energy resources related to coal, petroleum, and natural gas.
Resource development (2)	1	Characteristics of natural energy related to geothermal, solar, wind, and tide, assessment of natural energy resources, and development and management technologies of resources.
Resource development (3)	1	Development of uranium deposits, mechanism and characteristics of nuclear power generation, and management technologies of nuclear power.
Engineering geology (1)	1	Groundwater, long-term stability assessment of rock mass, chemical reaction of rocks with groundwater, and hydraulic properties of rocks at multi-scales.
Engineering geology (2)	1	Fundamentals of deep geological repository for high-level nuclear waste, CCS (carbon dioxide capture and storage), and underground storage of petroleum and gas.
Sustainability	2	Co-existence of natural resource development with environment, low-carbon society, and problems for human sustainability.

【Textbook】Printed materials on the class contents are distributed before each class.
【Textbook(supplemental)】References on each topic will be instructed in classes.
【Prerequisite(s)】Elementary knowledge of engineering, mathematics, physics, and geology.
【Web Sites】
【Additional Information】

10F234

Water Sanitary Engineering

水質衛生工学

【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】【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	5	
	5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F415

Ecomaterial and Environment-friendly Structures
環境材料設計学

【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

【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	4	Presentation by students on the individual topics Discussion on the topics

【Textbook】No set text

【Textbook(supplemental)】Instructed in class

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

【Web Sites】

【Additional Information】Questions and discusions are welcome

10F454

Systems Approach on Sound Material Cycles Society
循環型社会システム論

【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

【Instructor】Shinichi Sakai, Yasuhiro Hirai

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10A622

Geohydro Environment Engineering. Adv.
地圏環境工学特論

【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	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F446

Atmospheric and Global Environmental Engineering, Adv.
大気・地球環境工学特論

【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

【Instructor】Yuzuru MATSUOKA, Gakuji KURATA

【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)】

【Web Sites】

【Additional Information】

10A626

Advanced Environmental Health

環境衛生学特論

【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)】 【Language】Japanese

【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1	
	2	
	10	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10A632

Urban Metabolism Engineering
都市代謝工学

【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】Japanese

【Instructor】, ,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10A643

Environmental Microbiology, Adv.
環境微生物学特論

【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	
	2	
	1	
	1	
	2	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F456

New Environmental Engineering I, Advanced
新環境工学特論 I

【Code】10F456 【Course Year】 【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】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1.4	
	1.4	
	1.4	
	1.3	
	1.4	
	1.3	
	1.3	
	1.3	
	1.4	
	1.4	
	1.4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F458

New Environmental Engineering II, Advanced
新環境工学特論 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. Matsuoka, Prof. Shimidzu, Associate 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 (Matsuoka)
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)】
【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.
原子力環境工学

【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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W424

Environmental-friendly Technology for Sound Material Cycle

環境資源循環技術

【Code】10W424 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Fri 3rd

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

【Instructor】H.Tssuno,K.Miura,F.Nishimura,M.Takaoka,H.Nakagawa, , ,

【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
	7	
	4	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F468

Environmental Organic Micropollutants Analysis Lab.
環境微量分析演習

【Code】10F468 【Course Year】Master and Doctor Course 【Term】Intensive course (25th-27th 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】This 3 days intensive course, limited to around 10 people, will be held in Research Center for Environmental Quality Management in Otsu City. This course includes both lecture and experiments about analytical strategies of environmental micropollutants.

【Grading】Reports and attendance

【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】

【Textbook(supplemental)】

【Prerequisite(s)】

【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.

10F470

Advanced Enivironmental Engineering Lab.
環境工学先端実験演習

【Code】10F470 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】

【Location】C1-173 【Credits】2 【Restriction】 【Lecture Form(s)】Seminar and Exercise 【Language】Japanese

【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Seminer on Practical Issues in Urban and Environmental Enginering

環境工学実践セミナー

【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)】

【Web Sites】

【Additional Information】

10G039

Transport Phenomena
熱物質移動論

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

【Location】Engineering Science Depts Bldg.-212 【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)】

【Web Sites】

【Additional Information】

10G009

Quantum Condensed Matter Physics

量子物性物理学

【Code】10G009 【Course Year】Master Course 【Term】1st term 【Class day & Period】Wed 5th

【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	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10F112

Introduction to Sustainability/ Survivability Science

生存科学概論

【Code】10F112 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 2nd 【Location】C1-192 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】English 【Instructor】K. Takara (DPRI), H. Ishikawa (DPRI), B. He (DPRI), T. Hosoda (Engineering) and S. Yoden (Science)

【Course Description】There are many threats for human beings on the earth: medicine/infectious diseases, food, population, energy, water, environment and natural hazards and disasters. This class gives how to cope with these for human beings and societies. If we realized sustainable society, there are still catastrophes that we have to face. This class considers how to survive such catastrophic situations. Especially focused on are frequent and amplified extreme weather due to climatic change (or global warming) and subsequent severe disasters, water and environmental problems. Concepts and technologies for these problems are introduced, discussing the future perspectives of our society, science and technology based on various aspects and examples of climate, culture and ways of life in the world.

【Grading】Students will be evaluated by the number of attendance and a final written examination.

【Course Goals】Any graduate students in various disciplines can join this class. Mixture of different graduate students from different disciplines gives good discussions in the classroom in which global issues will be introduced and discussed by the teachers and students together. This is a graduate school level lecture class including presentations by students.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	The framework of sustainability/survivability science is given to understand its significance.
Examples	2	Introducing how to cope with various examples of threats that human beings are facing: medicine/infectious diseases, food, population, energy, water, environment and natural hazards and disasters.
Global warming and mitigation	3	A theory of global warming, technical countermeasures of mitigation and political situation in the world are given.
Extreme weather and its prediction	2	Recent water-related disasters and water problems due to extreme weather are introduced.
Adaptation	3	Examples and ideas of adaptation in the world are considered to cope with water-related disasters that are occurring more frequent and getting bigger.
Discussions	3	Giving students an opportunity to express their own ideas, teachers and students discuss his/her ideas.
Summary	1	Conclude this series of lectures.

【Textbook】No textbook specified. Handouts will be distributed if necessary.

【Textbook(supplemental)】Relevant literature would be introduced.

【Prerequisite(s)】The class is given in English with some Japanese language supplement for technical/special words. No background knowledge is necessary. Reading, writing and discussing in English is requirement.

【Web Sites】This lecture is related to a Global COE Program “Sustainability/survivability science for a resilient society adaptable to extreme weather conditions” (GCOE-ARS) for a period of 2009 to 2013. See also http://ars.gcoe.kyoto-u.ac.jp/ for further information.

【Additional Information】This class, which is given as graduate school-level lectures, can be taken by any graduate students from different disciplines including natural science, social science and humanity. Mixture of graduate students from different disciplines encourages exciting and interesting discussions by them to discuss global environmental issues with several professors and PDs.

10D040

Exercise in Practical Scientific English

実践的科学英語演習「留学ノススメ」

【Code】10D040 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】 【Location】

【Credits】1 【Restriction】 【Lecture Form(s)】Seminar 【Language】English

【Instructor】Kim Sunmin, Kenji Wada. etc

【Course Description】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Grading】Attendance 60%, midterm reports 20%, final report 20%. The final report must be submitted by the deadline date.

【Course Goals】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Course Topics】

Theme	Class number of times	Description
Introduction	2	Course Guidance, etc.
Exercise-1	1	Definition of technical writing 3C in technical writing Weaknesses of Japanese writers Good examples and bad examples
Exercise-2	1	Punctuation Presentation skills 1 -organization
Exercise-3	1	Organizing your thoughts for the title and abstract Presentation skills 2 ?Visual aspects
Exercise-4	1	Presenting the background of your research Presentation skills 3 ?Oral Aspects
Exercise-5	1	Describing how you did your research Presentation skills 4 ?Physical Aspects
Exercise-6	1	Presenting what you observed Presentation Practice
Exercise-7	1	Placing your findings in the field Presentation Practice
Exercise-8	1	Expressing thanks and listing references Presentation practice
Exercise-9	1	Writing your proposal Presentation practice
Exercise-10	1	Presentation practice Reviews & Feedbacks Evaluation
Presentation	2	Current situation of studying abraod, etc.
Wrap-up lecture	1	Achievement Assessment

【Textbook】No textbook is required.

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】http://www.ehcc.kyoto-u.ac.jp/alc/ (needs passwords).

【Additional Information】For details, contact Dr. Wada (wadaken@scl.kyoto-u.ac.jp).

10K001

Introduction to Advanced Material Science and Technology（English lecture）

先端マテリアルサイエンス通論（英語科目）

【Code】10K001 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Friday,4th-5th 【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture 【Language】English 【Instructor】

【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】In order to obtain two credits, students must attend at least ten lectures, and at least five of the submitted reports must be evaluated as “ passed ” by each lecturer. Each report should be submitted to the lecturer within two weeks after his/her lecture. NOTE: Reports are NOT acceptable from those who do not attend the lecture.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	Hyperthermophiles and their thermostable biomolecules H. Atomi
	1	Microreactor Technology for Production of High Functional Chemical Materials K.Mae
	2	Advanced Beam Processes and Characterization Technique for Nanotechnology J.Matsuo
	2	Chemical vapor deposition － Synthesis of advanced materials from gas phase M.Kawase
	1	Nanostructure Control in Structural Metallic Materials N.Tsuji
	1	Nano-optical Spectroscopy/Microscopy:Applications in Material Science H.Aoki
	1	Photonic Materials K.Hirao
	1	ISO Standards in Analytical Chemistry J. Kawai
	1	Electrodeposition and Electroless Deposition for Materials Processing K. Murase
	2	Bio-inspired Biomaterials H.Akiyoshi
		Confirmation of study achievement

【Textbook】None

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】Check the notice on the bulletin board.

10K004

New Engineering Materials, Adv.（English lecture）

新工業素材特論（英語科目）

【Code】10K004 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 5th

【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2

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

【Course Description】Outline: New materials are necessary for the advancement of high technologies, but in order to develop these new materials for practical applications, a number of problems must be solved. In this course, the problems encountered in the fields of chemical engineering, electrical / electronic engineering, mechanical engineering and civil engineering are discussed. Discussions are also held on natural resources, and how computers are being used in the development of new materials. Lectures are given in English.

【Grading】Credit: The evaluation of a student ’ s work will be given on a pass / fail basis, based on his / her attendance and reports, not on examinations.(1) Attending the class 10 times or more and submitting at least 5 reports with passing marks is required to receive 2 credits.(2) A report assignment will be given by every lecturer and must be submitted within 2 weeks from the end of the lecture.(3) A student ’ s report on any lecture from which he / she is absent will not be accepted.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	15	

【Textbook】

【Textbook(supplemental)】Class handouts

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D051

Frontiers in Modern Science & Technology
現代科学技術の巨人セミナー｢知のひらめき｣

【Code】10D051 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 5th

【Location】Katsura Hall 【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	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W401

Science and Technology for Making Substances
モノつくりの科学と技術

【Code】10W401 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【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
	1	
	2	
	1	
	3	
	2	
	1	
	1	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W403

Dimensional Control and Micro-Nano Systems
ディメンジョンの制御とナノ・マイクロ化学

【Code】10W403 【Course Year】1st year - 5th year 【Term】 【Class day & Period】 【Location】A2-302

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W405

Molecular Function and Composite-Assembly Function

分子機能と複合・集積機能

【Code】10W405 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 1st

【Location】A2-302 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture

【Language】Japanese

【Instructor】
H.Imahori,S.Kimura,T.Kakiuchi,Y.Tsuji,A.Toshimitsu,K.Tanaka,H.Kaji,T.Sato,K.Akagi,S.Ito,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】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W407

Physical Chemistry and Analytical Techniques of Complex Systems
複合系の物理化学と解析技術

【Code】10W407 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 5th

【Location】A2-304 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture

【Language】Japanese

【Instructor】

K.Tanaka,T.Takigawa,S.Shibata,T.Tanaka.H.Watanabe.H.Hasegawa,T.Yoshizaki,F.Tanaka,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	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W409

Frontiers in the Field of Chemical Biology and Biological Chemistry
化学から生物へ　生物から化学へ

【Code】10W409 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 5th

【Location】A2-302 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture

【Language】Japanese

【Instructor】S.Nishimoto,M.Shirakawa,Y.Tabata,H.Iwata,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, strucural biology, chemical biology,molecular physiology and others, are briefly explained and discussed.

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	14	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Nano Materials Science
ナノマテリアルサイエンス

【Code】10W410 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】Integrated Research Bldg.-102 【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
	12	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W412

Mechanics and Synthesis of Micro Machines II
機械とマイクロ機能創製Ⅱ

【Code】10W412 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】 【Location】

【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
	2	
	2	
	2	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Recent advances in fuel cell sciences
先端燃料電池

【Code】10W414 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Tue 2nd

【Location】A2-303 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture

【Language】Japanese 【Instructor】K.Eguchi,T.Abe,M.Kawase,T.Matsui,T.Shishido

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W416

Advances in Rechargeable Batteries
先端二次電池

【Code】10W416 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】A2-303 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Integrated Chemical Synthesis
集積合成化学

【Code】10W418 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】intesive course

【Location】A2-302 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Jun-ichi Yoshida

【Course Description】Usually, organic synthesis has been performed by stepwise formation of the individual bonds in the target molecule. However, it would be much more efficient if one could form several bonds in one sequence without isolating the intermediates. Therefore, conventional step-by-step synthesis is being supplemented with integrated synthesis which combines multiple components in a singleoperation in one pot or in a flow system. This course, which focus on space integration of reactions using flow microreactors. provides an outline of the concept of reaction integration in flow microreactors and some recent examples.

【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
introduction	1	brief introduction ot flow microreactor synthesis
residence time and mixing	2	principle of reaction control by taking advantage of flow microreactors such as precise residence time control and fast mixing
control of reactions	4	some examples of control of reactions such as reactions invovling short-live reactive intermediates and competitive consecutive reactions
organic reactions	4	various examples of organic reactions such as stochiometric reactions, catalytic reactions, photochemical reactions, and electrochemical reactions
polymerization	2	principles and examples of polymerization reactions using flow microreactors
industrial applications	2	some examples of industrial applications of flow microreactor synthesis

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W420

Experimental Integrated Chemical Systems
集積化学プロセス

【Code】10W420 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】

【Location】A2-302 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】J.Yoshida,S.Hasebe,K.Mae

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Design of Green Chemical Processing

ｸﾞﾘｰﾝｹﾐｽﾄﾘｰ & ｸﾞﾘｰﾝﾌﾟﾛｾｯｼﾝｸﾞの設計

【Code】10W422 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 1st

【Location】A2-303 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	4	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W424

Environmental-friendly Technology for Sound Material Cycle
環境資源循環技術

【Code】10W424 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Fri 3rd

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

【Instructor】H.Tssuno,K.Miura,F.Nishimura,M.Takaoka,H.Nakagawa, , ,

【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
	7	
	4	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W432

Laboratory and Exercise on Materials Engineering and Chemistry I

物質機能・変換科学特別実験及演習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)】

【Web Sites】

【Additional Information】

10W433

Laboratory and Exercise on Materials Engineering and Chemistry ＩＩ

物質機能・変換科学特別実験及演習Ⅱ

【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)】

【Web Sites】

【Additional Information】

10W434

Laboratory and Exercise on Materials Engineering and Chemistry III

物質機能・変換科学特別実験及演習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)】

【Web Sites】

【Additional Information】

10W435

Laboratory and Exercise on Materials Engineering and Chemistry IV

物質機能・変換科学特別実験及演習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)】

【Web Sites】

【Additional Information】

10W437

Advanced Seminar on Materials Engineering and Chemistry I

物質機能・変換科学特別セミナー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)】

【Web Sites】

【Additional Information】

10W438

Advanced Seminar on Materials Engineering and Chemistry II
物質機能・変換科学特別セミナー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)】

【Web Sites】

【Additional Information】

Advanced Seminar on Materials Engineering and Chemistry III

物質機能・変換科学特別セミナー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)】

【Web Sites】

【Additional Information】

10W440

Advanced Seminar on Materials Engineering and Chemistry IV

物質機能・変換科学特別セミナー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)】

【Web Sites】

【Additional Information】

10W441

Advanced Seminar on Materials Engineering and Chemistry V

物質機能・変換科学特別セミナー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)】

【Web Sites】

【Additional Information】

10W442

Advanced Seminar on Materials Engineering and Chemistry VI

物質機能・変換科学特別セミナー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)】

【Web Sites】

【Additional Information】

Internship Ⅰ

物質機能・変換科学インターンシップⅠ

【Code】10W444 【Course Year】Master and Doctor Course 【Term】1st+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)】

【Web Sites】

【Additional Information】

10W445

Internship Ⅱ

物質機能・変換科学インターンシップⅡ

【Code】10W445 【Course Year】Master and Doctor Course 【Term】1st+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)】

【Web Sites】

【Additional Information】

Internship Ⅲ

物質機能・変換科学インターンシップⅢ

【Code】10W446 【Course Year】Master and Doctor Course 【Term】1st+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)】

【Web Sites】

【Additional Information】

10W447

Internship Ⅳ

物質機能・変換科学インターンシップⅣ

【Code】10W447 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W448

Internship Ⅴ

物質機能・変換科学インターンシップⅤ

【Code】10W448 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W449

Internship Ⅵ
物質機能・変換科学インターンシップVI

【Code】10W449 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10K001

Introduction to Advanced Material Science and Technology（English lecture）

先端マテリアルサイエンス通論（英語科目）

【Code】10K001 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Friday,4th-5th
【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture 【Language】English 【Instructor】
【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】In order to obtain two credits, students must attend at least ten lectures, and at least five of the submitted reports must be evaluated as “ passed ” by each lecturer. Each report should be submitted to the lecturer within two weeks after his/her lecture. NOTE: Reports are NOT acceptable from those who do not attend the lecture.
【Course Goals】
【Course Topics】

Theme	Class number of times	Description
	2	Hyperthermophiles and their thermostable biomolecules H. Atomi
	1	Microreactor Technology for Production of High Functional Chemical Materials K.Mae
	2	Advanced Beam Processes and Characterization Technique for Nanotechnology J.Matsuo
	2	Chemical vapor deposition ― Synthesis of advanced materials from gas phase M.Kawase
	1	Nanostructure Control in Structural Metallic Materials N.Tsuji
	1	Nano-optical Spectroscopy/Microscopy:Applications in Material Science H.Aoki
	1	Photonic Materials K.Hirao
	1	ISO Standards in Analytical Chemistry J. Kawai
	1	Electrodeposition and Electroless Deposition for Materials Processing K. Murase
	2	Bio-inspired Biomaterials H.Akiyoshi
		Confirmation of study achievement

【Textbook】None
【Textbook(supplemental)】
【Prerequisite(s)】
【Web Sites】
【Additional Information】Check the notice on the bulletin board.

10K004

New Engineering Materials, Adv.（English lecture）

新工業素材特論（英語科目）

【Code】10K004 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 5th

【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2

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

【Course Description】Outline: New materials are necessary for the advancement of high technologies, but in order to develop these new materials for practical applications, a number of problems must be solved. In this course, the problems encountered in the fields of chemical engineering, electrical / electronic engineering, mechanical engineering and civil engineering are discussed. Discussions are also held on natural resources, and how computers are being used in the development of new materials. Lectures are given in English.

【Grading】Credit: The evaluation of a student ’ s work will be given on a pass / fail basis, based on his / her attendance and reports, not on examinations.(1) Attending the class 10 times or more and submitting at least 5 reports with passing marks is required to receive 2 credits.(2) A report assignment will be given by every lecturer and must be submitted within 2 weeks from the end of the lecture.(3) A student ’ s report on any lecture from which he / she is absent will not be accepted.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	15	

【Textbook】

【Textbook(supplemental)】Class handouts

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10i005

Business Japanease I
ビジネス日本語講座Ⅰ

【Code】10i005 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Thu 3rd

【Location】B-Cluster 3F Seminar Room A 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture

【Language】Japanese 【Instructor】Lect. Kurihara

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10i006

Business Japanease II

ビジネス日本語講座 II

【Code】10i006 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 3rd

【Location】B-Cluster 3F Seminar Room A 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture

【Language】Japanese 【Instructor】Lect. Kurihara

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	15	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C273

Social Core Advanced Materials I

社会基盤材料特論Ⅰ

【Code】10C273 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Tue 4th

【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	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C275

Social Core Advanced Materials ＩＩ

社会基盤材料特論II

【Code】10C275 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 4th

【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	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Materials Engineering and Chemistry Ⅰ

物質機能・変換科学特論Ⅰ

【Code】10W472 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W473

Materials Engineering and Chemistry Ⅱ

物質機能・変換科学特論Ⅱ

【Code】10W473 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W474

Materials Engineering and Chemistry III

物質機能・変換科学特論III

【Code】10W474 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W475

Materials Engineering and Chemistry Ⅳ

物質機能・変換科学特論IV

【Code】10W475 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W476

Materials Engineering and Chemistry Ⅴ

物質機能・変換科学特論Ⅴ

【Code】10W476 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W477

Materials Engineering and Chemistry Ⅵ
物質機能・変換科学特論VI

【Code】10W477 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W478

Materials Engineering and Chemistry Ⅶ

物質機能・変換科学特論VII

【Code】10W478 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

10W479

Materials Engineering and Chemistry Ⅷ

物質機能・変換科学特論Ⅷ

【Code】10W479 【Course Year】Master and 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)】

【Web Sites】

【Additional Information】

Instrumental Analysis, Adv. I

先端科学機器分析及び実習 I

【Code】10D043 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】

【Location】A2-304 【Credits】1 【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D046

Instrumental Analysis, Adv. II
先端科学機器分析及び実習 II

【Code】10D046 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】

【Location】A2-304 【Credits】1 【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D040

Exercise in Practical Scientific English

実践的科学英語演習「留学ノススメ」

【Code】10D040 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】 【Location】

【Credits】1 【Restriction】 【Lecture Form(s)】Seminar 【Language】English

【Instructor】Kim Sunmin, Kenji Wada. etc

【Course Description】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Grading】Attendance 60%, midterm reports 20%, final report 20%. The final report must be submitted by the deadline date.

【Course Goals】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Course Topics】

Theme	Class number of times	Description
Introduction	2	Course Guidance, etc.
Exercise-1	1	Definition of technical writing 3C in technical writing Weaknesses of Japanese writers Good examples and bad examples
Exercise-2	1	Punctuation Presentation skills 1 -organization
Exercise-3	1	Organizing your thoughts for the title and abstract Presentation skills 2 ?Visual aspects
Exercise-4	1	Presenting the background of your research Presentation skills 3 ?Oral Aspects
Exercise-5	1	Describing how you did your research Presentation skills 4 ?Physical Aspects
Exercise-6	1	Presenting what you observed Presentation Practice
Exercise-7	1	Placing your findings in the field Presentation Practice
Exercise-8	1	Expressing thanks and listing references Presentation practice
Exercise-9	1	Writing your proposal Presentation practice
Exercise-10	1	Presentation practice Reviews & Feedbacks Evaluation
Presentation	2	Current situation of studying abraod, etc.
Wrap-up lecture	1	Achievement Assessment

【Textbook】No textbook is required.

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】http://www.ehcc.kyoto-u.ac.jp/alc/ (needs passwords).

【Additional Information】For details, contact Dr. Wada (wadaken@scl.kyoto-u.ac.jp).

10W459

Experimental Integrated Chemical Systems

集積化学システム

【Code】10W459 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】 【Location】

【Credits】2 【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
	4	
	4	
	4	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C283

International Student Seminar on Integrated Materials

統合物質科学学生国際セミナー

【Code】10C283 【Course Year】Doctor Course 【Term】1st+2nd term 【Class day & Period】 【Location】

【Credits】2 【Restriction】 【Lecture Form(s)】Exercise 【Language】English 【Instructor】

【Course Description】In this course, students organize an international seminar on Integrated Materials, which covers a wide variety of topics in materials science and chemistry, in cooperation with students at foreign universities.

【Grading】Evaluations are made on the basis of the overall activity in organizing the international seminar.

【Course Goals】Learning skills in scientific presentation, discussion, and negotiation in English via organizing the seminar in cooperation with students at foreign universities.

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W463

Seminar on Materials Engineering and Chemistry Ⅰ

物質機能・変換科学セミナーⅠ

【Code】10W463 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】Katsura Campus 【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)】

【Web Sites】

【Additional Information】

10W464

Seminar on Materials Engineering and Chemistry Ⅱ

物質機能・変換科学セミナーⅡ

【Code】10W464 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】Katsura Campus 【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)】

【Web Sites】

【Additional Information】

10W465

Seminar on Materials Engineering and Chemistry III

物質機能・変換科学セミナーIII

【Code】10W465 【Course Year】Master and Doctor Course 【Term】1st+2nd term 【Class day & Period】

【Location】Katsura Campus 【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)】

【Web Sites】

【Additional Information】

10W466

Seminar on Materials Engineering and Chemistry Ⅳ

物質機能・変換科学セミナーⅣ

【Code】10W466 【Course Year】Master and Doctor Course 【Term】1st+2nd term 【Class day & Period】

【Location】Katsura Campus 【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)】

【Web Sites】

【Additional Information】

10W467

Seminar on Materials Engineering and Chemistry Ⅴ
物質機能・変換科学セミナーⅤ

【Code】10W467 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】Yoshida Campus 【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)】

【Web Sites】

【Additional Information】

10W468

Seminar on Materials Engineering and Chemistry Ⅵ

物質機能・変換科学セミナーⅥ

【Code】10W468 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】Yoshida Campus 【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)】

【Web Sites】

【Additional Information】

10W469

Seminar on Materials Engineering and Chemistry Ⅶ

物質機能・変換科学セミナーⅦ

【Code】10W469 【Course Year】Master and Doctor Course 【Term】1st+2nd term 【Class day & Period】

【Location】Yoshida Campus 【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)】

【Web Sites】

【Additional Information】

10W470

Seminar on Materials Engineering and Chemistry Ⅷ

物質機能・変換科学セミナーⅧ

【Code】10W470 【Course Year】Master and Doctor Course 【Term】1st+2nd term 【Class day & Period】

【Location】Yoshida Campus 【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)】

【Web Sites】

【Additional Information】

10D051

Frontiers in Modern Science & Technology
現代科学技術の巨人セミナー「知のひらめき」

【Code】10D051 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 5th

【Location】Katsura Hall 【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	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W603

Introduction to Biomedical Engineering
医工学基礎

【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)】

【Web Sites】

【Additional Information】

10C070

Introduction to Quantum Science
基礎量子科学

【Code】10C070 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Fri 2nd

【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
	9	
	2	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D636

Polymer Design for Biomedical and Pharmaceutical Applications

医薬用高分子設計学

【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)】

【Web Sites】

【Additional Information】

10V201

Introduction to the Design and Implementation of Micro-Systems
微小電気機械システム創製学

【Code】10V201 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 2nd

【Location】Engineering Science Depts Bldg.-216 【Credits】2

【Restriction】Take class 10G205 "Microsystem Engineering" 【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".

【Web Sites】

【Additional Information】The student of this class is required to take the course 10G205 "Microsystem Engineering", which provide the knowledge about the theory of sensing and actuating in microsystem. Those who wants to take this course have to take training course for CAD in advance. For more detail, please contact one of the instructors as early as possible.

10W620

Radiation Measurement for Medicine

医学放射線計測学

【Code】10W620 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 2nd 【Location】Bldg.No.1-Nuclear Engineering 2 【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	1-2	
Fundamentals for Chemical Effects of Radiation Interactions	1	
Fundamental Quantities and Units for Radiation	1-2	
Radiation Measurements in Medical Physics	2-3	
Radiation Dosimetry	1-2	
Estimation for Dose Distribution	1-2	
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)】

【Web Sites】

【Additional Information】

10C072

Introduction to Advanced Nuclear Engineering

基礎量子エネルギー工学

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

【Location】Bldg.No.1-Nuclear Engineering 1 【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)】

【Web Sites】

【Additional Information】

10G203

Micro Process and Material Engineering
マイクロプロセス・材料工学

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

【Location】Engineering Science Depts Bldg.-216 【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	2	
Soft-micromachining	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G209

Multi physics Numerical Analysis
マルチフィジクス数値解析力学

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

【Location】Engineering Science Depts Bldg.-101 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture

【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	2	
	5	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G041

Advanced Finite Element Methods

有限要素法特論

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

【Location】Engineering Science Depts Bldg.-212 【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

【Web Sites】

【Additional Information】

10G205

Microsystem Engineering

マイクロシステム工学

【Code】10G205 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Mon 3rd

【Location】Engineering Science Depts Bldg.-216 【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".

【Web Sites】

【Additional Information】The student of this class is strongly recommended to take a course 10V201 "Introduction to the Design and Implementation of Micro-Systems", which is a practice for designing microsystem. Those who wants to take this course, please contact one of the instructors as early as possible.

10C074

Quantum Science
量子科学

【Code】10C074 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 2nd

【Location】Bldg.No.1-Nuclear Engineering 2 【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

【Web Sites】

【Additional Information】

10C017

Radiation Physics and Engineering

放射線物理工学

【Code】10C017 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 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
	3	
	5	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C047

Radiation Medical Physics

放射線医学物理学

【Code】10C047 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 3rd

【Location】Bldg.No.1-Nuclear Engineering Sminar Room 1 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Yoshinori Sakurai, Tooru Kobayashi, Hiroki Tanaka

【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 radiation protection, 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
Fundamental physics for radiation	1-2	
Fundamental bilology for radiation	1-2	
Radiation measurement and evaluation	1-2	
Physics in radiation diagnosis	2-3	
Physics in radiation therapy	2-3	
Quality assurance and standard dosimetry	1	
Radiation protection	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.

【Web Sites】

【Additional Information】

Radiation Biology and Medicine
放射線生物医学

【Code】10C046 【Course Year】Master Course 【Term】1st term 【Class day & Period】Mon 2nd

【Location】Bldg.No.1-Nuclear Engineering Sminar Room 1 【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)】

【Web Sites】

【Additional Information】

10C078

Hybrid Advanced Accelerator Engineering
複合加速器工学

【Code】10C078 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 3rd

【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
	1	
	2	
	3	
	2	
	3	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W606

Diagnostic Imaging
画像診断学

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W618

Radiation Treatment Planning,Radiation Treatment Metrology,Practice

放射線治療計画・計測学実習

【Code】10W618 【Course Year】Master and Doctor Course 【Term】1st+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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C068

Nuclear Engineering Application Experiments
原子力工学応用実験

【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)】

【Web Sites】

【Additional Information】

10C084

Nuclear Engineering, Adv.
原子核工学最前線

【Code】10C084 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Thu 3rd

【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
	1	
	11	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D649

Polymer Synthesis

高分子合成

【Code】10D649 【Course Year】Master Course 【Term】1st term 【Class day & Period】Wed 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	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Polymer Physical Properties

高分子物性

【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.

【Web Sites】

【Additional Information】

10D645

Polymer Functional Chemistry

高分子機能化学

【Code】10D645 【Course Year】Master and Doctor Course 【Term】1st 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	
	2	
	2	
	2	
	4	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D607

Design of Polymerization Reactions
高分子生成論

【Code】10D607 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】 【Location】

【Credits】2 【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	
	3	
	3	
	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D610

Reactive Polymers

反応性高分子

【Code】10D610 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 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	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	3	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D613

Polymer Structure and Function

高分子機能学

【Code】10D613 【Course Year】Master Course 【Term】1st term 【Class day & Period】Tue 2nd 【Location】

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

【Course Description】Polymers are indispensable in our modern society, fundamental in industry, and functional for chemistry, medicine, electronics, and many other advanced and emerging technologies. In this class, photo- and electric 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 real systems.

【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	
Photofunctional Polymers	5	
Nanostructure and Dynamics of Polymers	2	
Electronic Functions of Polymers	5	
Advanced Functionality of Polymers	2	

【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 of undergraduate.

【Web Sites】

【Additional Information】

10D616

Polymer Supermolecular Structure

高分子集合体構造

【Code】10D616 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】 【Location】

【Credits】2 【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	5	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	5	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.

【Web Sites】

【Additional Information】

10D611

Biomacromolecular Science
生体機能高分子

【Code】10D611 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Tue 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D643

Polymer Solution Science

高分子溶液学

【Code】10D643 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 2nd

【Location】A2-307 【Credits】2 【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	4	Principles of the light scattering and viscosity experiments.
Polymer chain models and their statistics	4	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)."

【Web Sites】

【Additional Information】

10D622

Physical Chemistry of Polymers
高分子基礎物理化学

【Code】10D622 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 2nd

【Location】A2-307 【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	
	2	
	2	
	2	
	2	
	2	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D625

Polymer Spectroscopy

高分子分光学

【Code】10D625 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】 【Location】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4	
	2	
	2	
	3	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D628

Design of Polymer Materials
高分子材料設計

【Code】10D628 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】

【Location】ICR Seminar Room 【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	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D647

Polymer Controlled Synthesis

高分子制御合成

【Code】10D647 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】 【Location】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D633

Biomaterials Science and Engineering

高分子医工学

【Code】10D633 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】 【Location】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D028

Polymer Physics and Function

高分子機能物性

【Code】10D028 【Course Year】Master Course 【Term】(not held; biennially) 【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
	3	
	5	
	3	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10E022

Engineering for Chemical Materials Processing
化学材料プロセス工学

【Code】10E022 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 4th

【Location】A2-302 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】M.Ohshima,S.Nagamine

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10E016

Fine Particle Technology, Adv.

微粒子工学特論

【Code】10E016 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 2nd

【Location】A2-302 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】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	4	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	4	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	3	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.
Particle sampling	1	Sampling of fine particles and statistical evaluation methods are explained.

【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

【Web Sites】

【Additional Information】

10E019

Surface Control Engineering
界面制御工学

【Code】10E019 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 2nd

【Location】A2-305 【Credits】2 【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	
	3	
	4	
	2	
	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C205

Thermodynamics for Materials Science, Adv. A
材料熱力学特論A

【Code】10C205 【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
Thermodynamics and Elasticity	2	
Generalization of thermodynamic potneitals	3	
Basic of micromechanics	2	
Basic of statistical thermodyanamics	1	
Statistical physics of lattice	3	
Landau's phenomenology for phase transtision	3	
Basic science of glasses	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C206

Thermodynamics for Materials Science, Adv. B
材料熱力学特論Ｂ

【Code】10C206 【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
	4	
	3	
	3	
	3	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】http://www.aqua.mtl.kyoto-u.ac.jp/

【Additional Information】

10D007

Chemistry of Polymer Materials

高分子材料化学

【Code】10D007 【Course Year】Master Course 【Term】1st term 【Class day & Period】Fri 2nd

【Location】A2-302 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4	
	3	
	8	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D031

Chemistry of Biomaterials

生体材料化学

【Code】10D031 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Tue 2nd

【Location】A2-302 【Credits】2 【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	14	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D216

Functional Solution Chemistry

機能性溶液化学

【Code】10D216 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Mon 2nd

【Location】A2-303 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】T.Kakiuchi

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10V426

Functionalized Nucleic Acids Chemistry
機能性核酸化学

【Code】10V426 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】A2-303 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Nishimoto and Tanabe

【Course Description】A number of challenges have been made on development of modified DNA, RNA and proteins, chemical or physical properties of which are controlled by several triggers. These intelligent materials are promising for next generation gene diagnostics and therapy. In this lecture, we discuss the molecular design of these artificial biological materials and their application.

【Grading】attendance and report

【Course Goals】Synthetic chemistry of DNA, RNA and protein//Chemical structure and basic funciton of biological materials//Regulation of biological function//Medical applications of artificial DNA, RNA and protein

【Course Topics】

Theme	Class number of times	Description
Chemical structure and synthesis	2	Synthetic chemistry of nucleic acids
Gene manipulation	2	Synthesis of protein Gene Sequencing
Functions of intelligent molecules	2	Function of artificial peptides Functions of artificial nucleic acids
Drugs related to DNA	2	DNA cleavage by drugs Crosslinking by artificial nucleic acids Alkylation by drugs
Expansion of genetic code	2	Artificial nucleobases Synthesis of modified protein in cells
Medical application	2	Molecular targeting Molecular imaging
Recent topics	3	

【Textbook】

【Textbook(supplemental)】No textbooks are used.

【Prerequisite(s)】Basic knowledge in organic chemistry and biological chemistry is requisite.

【Web Sites】

【Additional Information】

10D812

Molecular Biology

分子生物化学

【Code】10D812 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】 【Location】

【Credits】2 【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	3	
Gaseous bioactive molecules	3	
Experiments to observe cellular responses	3	

【Textbook】Provided in the course

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D815

Biorecognics
生体認識化学

【Code】10D815 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Thu 2nd

【Location】A2-308 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D813

Bioorganic Chemistry
生物有機化学

【Code】10D813 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】 【Location】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D816

Biotechnology
生物工学

【Code】10D816 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】 【Location】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D808

Physical Organic Chemistry
物理有機化学

【Code】10D808 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 2nd

【Location】A2-308 【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)】

【Web Sites】

【Additional Information】

10D818

Advanced Organic Chemistry
先端有機化学

【Code】10D818 【Course Year】Master Course 【Term】1st term 【Class day & Period】Tue 1st

【Location】A2-306 【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	
	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D448

Biomolecular Function Chemistry
生体分子機能化学

【Code】10D448 【Course Year】Master and Doctor Course 【Term】(not held; biennially)

【Class day & Period】Mon 2nd 【Location】A2-304 【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	
	2	
	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W409

Frontiers in the Field of Chemical Biology and Biological Chemistry
化学から生物へ　生物から化学へ

【Code】10W409 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 5th

【Location】A2-302 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture

【Language】Japanese

【Instructor】S.Nishimoto,M.Shirakawa,Y.Tabata,H.Iwata,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, strucural biology, chemical biology,molecular physiology and others, are briefly explained and discussed.

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	14	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W641

Physiology
生理学

【Code】10W641 【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10R001

Quantum Beam Science, Adv.
量子ビーム科学特論

【Code】10R001 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Fri 4th

【Location】Engineering Science Depts Bldg.-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
	6	
	4	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C018

Neutron Science
中性子科学

【Code】10C018 【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
	3	
	6	
	2	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C031

Quantum Manipulation Technology
量子制御工学

【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)】

【Web Sites】

【Additional Information】

10C082

Applied Neutron Engineering
応用中性子工学

【Code】10C082 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 3rd

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W651

High Precision Radiation Therapy
高精度放射線治療学

【Code】10W651 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】 【Location】

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

【Instructor】, , , , , ,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W696

Human Anatomy

人体構造学

【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)】

【Web Sites】

【Additional Information】

10D638

Advanced Seminar on Polymer Industry

高分子産業特論

【Code】10D638 【Course Year】Master Course 【Term】1st term 【Class day & Period】Fri 3rd and 4th

【Location】A2-306 【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	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C234

Physics of Mesoscopic Materials

メゾ材料物性学

【Code】10C234 【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】Akira Sakai, Shu Kurokawa

【Course Description】The first half of the lecture explains the mesoscopic phenomena, a variety of electronic transport phenomena observed in a nano- or atomic-scale specimen that is smaller in size than the mean free path of electrons. The second half covers scanning probe microscopy (SPM), a powerful observation tool widely exploited in nanotechnology. Principles of various types of SPM and their applications in materials science are exposited with many illustrative examples.

【Grading】Grading will be made based on the report on the assigned problems.

【Course Goals】The final goal of this lecture is to make students acquire basic understanding on the mesoscopic phenomena and the characterization of materials with SPM.

【Course Topics】

Theme	Class number of times	Description
Mesocopic electron transport phenomena	7	1. Introduction to electronic conduction 2. Quantum interference between electrons and its influence on electronic conduction 3. Ballistic conduction 4. Single-electron tunneling 5. Electron transport through atom-sized contacts of metals 6. Electron transport through single molecules 7. Newest topics of mesoscopic electronic conduction
Materials characterization with SPM	8	1. Atomic and electronic structures of surfaces 2. Properties of tunneling electrons 4. Forces acting across ultrasmall junctions 5. Materials characterization with SPM (1) 6. Materials characterization with SPM (2) 7. Materials characterization with SPM (3) 8. Cutting-edge SPM researches

【Textbook】Lacture notes in a paper form will be distributed.

【Textbook(supplemental)】

【Prerequisite(s)】Prerequisite courses: "Solid state physics", or equivalent, in the undergraduate course.

【Web Sites】

【Additional Information】

10V003

Biomechanics

バイオメカニクス

【Code】10V003 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 3rd

【Location】Engineering Science Depts Bldg.-830 【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)】

【Web Sites】

【Additional Information】

10D450

Biomolecular Dynamics
生体分子動力学

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

【Location】Engineering Science Depts Bldg.-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
	2	
	2	
	2	
	3	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10B407

Robotics
ロボティクス

【Code】10B407 【Course Year】Master Course 【Term】2nd 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	
	4	
	1	
	3	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D413

Molecular Materials

分子機能材料

【Code】10D413 【Course Year】Master and Doctor Course 【Term】(not held; biennially)

【Class day & Period】Wed 2nd 【Location】A2-304 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】K. Tanaka and A. Ito

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	12	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10S202

Green and Sustainable Chemistry
物質環境化学

【Code】10S202 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 2nd

【Location】A2-303 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】K.Ohe,Y.Tsuji,T.Kakiuchi

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D207

Excited-State Hydrocarbon Chemistry
励起物質化学

【Code】10D207 【Course Year】Master and Doctor Course 【Term】 【Class day & Period】

【Location】A2-303 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】S.Nishimoto

【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)】

【Web Sites】

【Additional Information】

10E001

Special Topics in Transport Phenomena
移動現象特論

【Code】10E001 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 4th

【Location】A2-305 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】R.Yamamoto

【Course Description】Theoretical approaches on momentum, heat, and mass transports will be discussed. For example, problems of non-steady transport such as transient behavior, hydrodynamics of complex fluids such as polymeric liquids will be treated.

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	3	
	3	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10E007

Chemical Reaction Engineering, Adv.
反応工学特論

【Code】10E007 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Fri 2nd

【Location】A2-305 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Miura, Kawase

【Course Description】Kinetic analysis of gas-solid-catalyst reaction and gas-solid reaction
Operation and design of reactors for gas-solid-catalyst and gas-solid reactions
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】

【Course Topics】

Theme	Class number of times	Description
Gas-solid reaction I. Industrial gas-solid reactions	2	As examples of industrial gas-solid reactions, the pyrolysis (carbonization) and gasification of coal as well as reactors for these reactions are explained.
Gas-solid reaction II. Kinetic analysis of gas-solid reaction	3.5	Kinetic measurement and analysis of complicated reactions, particularly coal pyrolysis, are explained from the first-order reaction model to the distributed activation energy model (DAEM).
Gas-solid reaction III. Models of gas-solid reactions	2.5	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.
Gas-solid-catalyst reaction I. Effectiveness factor and selectivity	2	Commercial catalysts and industrial gas-solid-catalyst reactions are overviewed. The generalized effectiveness factor and the selectivity affected by mass transfer are explained.
Gas-solid-catalyst reaction II. Industrial catalytic reactors	2	Industrial catalytic reactors including fixed-bed and fluidized-bed reactors are overviewed. Design and operation of these reactors including thermal stability are explained.
Gas-solid-catalyst reaction III. Deactivation and regeneration of catalyst	3	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.

【Textbook】Prints are distributed.

【Textbook(supplemental)】

【Prerequisite(s)】Needs knowledge of chemical reaction engineering including heterogeneous reactions.

【Web Sites】

【Additional Information】

10E004

Separation Process Engineeering, Adv.
分離操作特論

【Code】10E004 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 2nd

【Location】A2-305 【Credits】2 【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	
	2	
	1	
	1	
	2	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10K001

Introduction to Advanced Material Science and Technology（English lecture）

先端マテリアルサイエンス通論（英語科目）

【Code】10K001 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Friday,4th-5th 【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture 【Language】English 【Instructor】

【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】In order to obtain two credits, students must attend at least ten lectures, and at least five of the submitted reports must be evaluated as “ passed ” by each lecturer. Each report should be submitted to the lecturer within two weeks after his/her lecture. NOTE: Reports are NOT acceptable from those who do not attend the lecture.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	Hyperthermophiles and their thermostable biomolecules H. Atomi
	1	Microreactor Technology for Production of High Functional Chemical Materials K.Mae
	2	Advanced Beam Processes and Characterization Technique for Nanotechnology J.Matsuo
	2	Chemical vapor deposition － Synthesis of advanced materials from gas phase M.Kawase
	1	Nanostructure Control in Structural Metallic Materials N.Tsuji
	1	Nano-optical Spectroscopy/Microscopy:Applications in Material Science H.Aoki
	1	Photonic Materials K.Hirao
	1	ISO Standards in Analytical Chemistry J. Kawai
	1	Electrodeposition and Electroless Deposition for Materials Processing K. Murase
	2	Bio-inspired Biomaterials H.Akiyoshi
		Confirmation of study achievement

【Textbook】None

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】Check the notice on the bulletin board.

10K004

New Engineering Materials, Adv.（English lecture）

新工業素材特論（英語科目）

【Code】10K004 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Thu 5th

【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2

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

【Course Description】Outline: New materials are necessary for the advancement of high technologies, but in order to develop these new materials for practical applications, a number of problems must be solved. In this course, the problems encountered in the fields of chemical engineering, electrical / electronic engineering, mechanical engineering and civil engineering are discussed. Discussions are also held on natural resources, and how computers are being used in the development of new materials. Lectures are given in English.

【Grading】Credit: The evaluation of a student ’ s work will be given on a pass / fail basis, based on his / her attendance and reports, not on examinations.(1) Attending the class 10 times or more and submitting at least 5 reports with passing marks is required to receive 2 credits.(2) A report assignment will be given by every lecturer and must be submitted within 2 weeks from the end of the lecture.(3) A student ’ s report on any lecture from which he / she is absent will not be accepted.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	15	

【Textbook】

【Textbook(supplemental)】Class handouts

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D051

Frontiers in Modern Science & Technology

現代科学技術の巨人セミナー「知のひらめき」

【Code】10D051 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 5th

【Location】Katsura Hall 【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	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D040

Exercise in Practical Scientific English

実践的科学英語演習「留学ノススメ」

【Code】10D040 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】 【Location】

【Credits】1 【Restriction】 【Lecture Form(s)】Seminar 【Language】English

【Instructor】Kim Sunmin, Kenji Wada. etc

【Course Description】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Grading】Attendance 60%, midterm reports 20%, final report 20%. The final report must be submitted by the deadline date.

【Course Goals】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Course Topics】

Theme	Class number of times	Description
Introduction	2	Course Guidance, etc.
Exercise-1	1	Definition of technical writing 3C in technical writing Weaknesses of Japanese writers Good examples and bad examples
Exercise-2	1	Punctuation Presentation skills 1 -organization
Exercise-3	1	Organizing your thoughts for the title and abstract Presentation skills 2 ?Visual aspects
Exercise-4	1	Presenting the background of your research Presentation skills 3 ?Oral Aspects
Exercise-5	1	Describing how you did your research Presentation skills 4 ?Physical Aspects
Exercise-6	1	Presenting what you observed Presentation Practice
Exercise-7	1	Placing your findings in the field Presentation Practice
Exercise-8	1	Expressing thanks and listing references Presentation practice
Exercise-9	1	Writing your proposal Presentation practice
Exercise-10	1	Presentation practice Reviews & Feedbacks Evaluation
Presentation	2	Current situation of studying abraod, etc.
Wrap-up lecture	1	Achievement Assessment

【Textbook】No textbook is required.

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】http://www.ehcc.kyoto-u.ac.jp/alc/ (needs passwords).

【Additional Information】For details, contact Dr. Wada (wadaken@scl.kyoto-u.ac.jp).

10D043

Instrumental Analysis, Adv. I

先端科学機器分析及び実習 I

【Code】10D043 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】

【Location】A2-304 【Credits】1 【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D046

Instrumental Analysis, Adv. II

先端科学機器分析及び実習 II

【Code】10D046 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】

【Location】A2-304 【Credits】1 【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10W681

Experiments and Exercises on Bio-Medical Engineering, Adv. I

生命・医工分野特別実験および演習第一

【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)】

【Web Sites】

【Additional Information】

10W683

Experiments and Exercises on Bio-Medical Engineering, Adv. II

生命・医工分野特別実験および演習第二

【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)】

【Web Sites】

【Additional Information】

10W670

Seminar on Bio-Medical Engineering A(MC)

生命医工分野セミナーＡ(修士)

【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)】

【Web Sites】

【Additional Information】

10W671

Seminar on Bio-Medical Engineering B(MC)

生命医工分野セミナーＢ (修士)

【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)】

【Web Sites】

【Additional Information】

10W685

Seminar on Bio-Medical Engineering A

生命・医工分野特別セミナー 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)】

【Web Sites】

【Additional Information】

10W687

Seminar on Bio-Medical Engineering B

生命・医工分野特別セミナー 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)】

【Web Sites】

【Additional Information】

10W689

Seminar on Bio-Medical Engineering C
生命・医工分野特別セミナー 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)】

【Web Sites】

【Additional Information】

10W690

Seminar on Bio-Medical Engineering D

生命・医工分野特別セミナー 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)】

【Web Sites】

【Additional Information】

10W691

Bio-Medical Engineering Internship M

インターンシップ M（生命・医工）

【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)】

【Web Sites】

【Additional Information】

10W692

Bio-Medical Engineering Internship D

インターンシップ D（生命・医工）

【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)】

【Web Sites】

【Additional Information】

10X001

Prospects of Interdisciplinary Photonics and Electronics

融合光･電子科学の展望

【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)】

【Web Sites】

【Additional Information】

10X003

Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics Ⅰ

融合光・電子科学特別実験及演習 1

【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)】

【Web Sites】

【Additional Information】

10X005

Advanced Experiments and Exercises in Interdisciplinary Photonics and Electronics Ⅱ

融合光・電子科学特別実験及演習２

【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)】

【Web Sites】

【Additional Information】

10X007

Advanced Seminar on Interdisciplinary Photonics and Electronics
融合光・電子科学特別セミナー

【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)】

【Web Sites】

【Additional Information】

10C825

Quantum Mechanics for Electronics Engineering
量子論電子工学

【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	
	3	
	1	
	1	
	1	
	1	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C801

Charged Particle Beam Apparatus
電子装置特論

【Code】10C801 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Wed 4th 【Location】

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

【Instructor】Yasuhito Gotoh

【Course Description】Fundamental technologies of an ion beam apparatus, such as ion source, formation and evaluation of ion beam, transport of ion beam, and ioni-solid interaction will be presented. Taking ion implantation as one of the example of the ion application, the relationship between the incident ion energy and implantation depth will be presented. Each element of a typical ion beam apparatus 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.
Generation and transport of ion beam	4	Methods of ion generation for various elements are explained. Important euqations 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	4	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.
Design of ion beam system	2	As a summary of the course, design of the simple ion beam system is given. Prior to the design, some important knowledges about vacuum pumps and components are shown.

【Textbook】Yasuhito Gotoh, Charged Particle Beam Appratus, 2011 version (Will be sold at CO-OP shop)

【Textbook(supplemental)】Junzo Ishikawa, Charged Particle Engineering (Corona).

【Prerequisite(s)】Vacuum Electronic Engineering 1, 2 (undergraduate course)

【Web Sites】

【Additional Information】

10C807

Plasma Science and Engineering, Adv.
プラズマ工学特論

【Code】10C807 【Course Year】Master Course 【Term】1st term 【Class day & Period】Mon 3rd 【Location】

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

【Instructor】Osamu SAKAI

【Course Description】Main regimes of plasma generation such as capacitive-coupled discharges, inductive-coupled discharges, and wave-propagation discharges are investigated and categorized with discussion of wave-heating mechanisms and particle/energy balance equations. These discussions are based on elementary process of atoms and molecules and wave dispersions in a plasma. In addition, various wave modes emerging in a spatiotemporal structure of plasmas are addressed.

【Grading】Judged by regular examination and submitted report sheet. (In some years, regular examination is replaced by a set of report sheets.)

【Course Goals】Reviewing fundamentals of plasma engineering, understandings of industrially-available plasma sources and electromagnetic-wave propagation in a plasma are required.

【Course Topics】

Theme	Class number of times	Description
Fundamentals	2-3	Reviewing fundamentals of plasma engineering, basic phenomena including elementary processes in a plasma are addressed.
Plasma sources	6-7	Based on wave propagation in a plasma, regimes of plasma generation such as capacitive-coupled discharges, inductive-coupled discharges, and wave-propagation discharges are investigated and categorized with discussion of wave-heating mechanisms and particle/energy balance equations.
Electromagnetic wave propagation	5-6	Various wave modes emerging in a spatiotemporal structure of plasmas are addressed; not only gaseous plasmas but also plasmas in solids are discussed.

【Textbook】

【Textbook(supplemental)】F. F. Chen and J. P. Chang, Lecture Notes on Principles of Plasma Processing (Kluwar Academic/Plenum Publishing, New York, 2003)

【Prerequisite(s)】Knowledge addressed in plasma science and engineering in the bachelor course, or similar one corresponding to this subject.

【Web Sites】

【Additional Information】

10C810

Semiconductor Engineering Adv.

半導体工学特論

【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)

【Web Sites】

【Additional Information】

10C813

Electronic Materials Adv.

電子材料学特論

【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)】

【Web Sites】

【Additional Information】

10C816

Molecular Electronics
分子エレクトロニクス

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C819

Surface Electronic Properties

表面電子物性工学

【Code】10C819 【Course Year】Master Course 【Term】1st term 【Class day & Period】Tue 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
	2	
	3	
	6	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C822

Optical Properties and Engineering
光物性工学

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C828

Quantum Optoelectronics Devices

光量子デバイス工学

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C829

Quantum Optics

量子光学

【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)】

【Web Sites】

【Additional Information】

10C830

Quantum Measurement

量子計測工学

【Code】10C830 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Mon 4th 【Location】

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

【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	1.5	Two principles of time measurement: Reproducibility postulate and dynamic model
Time and relativistic theory	3	Impact of special and general relativistic theory on time measurement
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	2.5	Incoherent signals and shot noise
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.

【Web Sites】https://www.kogaku.kyoto-u.ac.jp/lecturenotes/

【Additional Information】

10C851

Electrical Conduction in Condensed Matter

電気伝導

【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
	4	
	2	
	3	
	3	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C834

High Performance Thin Film Engineering
高機能薄膜工学

【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	
	2-3	
	2	
	2-3	
	5-6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

693631

Integrated Circuits Engineering, Advanced.
集積回路工学特論

【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】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C628

State Space Theory of Dynamical Systems
状態方程式論

【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

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】classical control theory (in terms of transfer functions), linear algebra and calculus

【Web Sites】

【Additional Information】Handouts will be given at the class.

10C604

Applied Systems Theory
応用システム理論

【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】The grading will be based on an exam and the 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	1	necessity and importance of combinatorial optimization, and typical problems
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
complexity	1	complexity, classes P and NP, complexity of combinatorial optimization problems, necessity of approximate solution methods and meta-heuristics
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. The level of understanding will be confirmed.

【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

【Web Sites】

【Additional Information】Handouts and exercises are given at the class.

10C601

Applied Mathematics for Electrical Engineering
電気数学特論

【Code】10C601 【Course Year】Master Course 【Term】1st term 【Class day & Period】Wed 1st 【Location】

【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	
	3	
	3	
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	4	Hamiltonian mechanics on linear symplectic space is lectured.
Manifold and vector field	3	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

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

【Additional Information】Appropriate references will be shown in classes.

10C647

Electrical and Electromagnetic Circuits

電気電磁回路論

【Code】10C647 【Course Year】Master 1st 【Term】1st term 【Class day & Period】Wed 2nd 【Location】

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

【Instructor】Osami Wada

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	8	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C610

Electromagnetic Theory, Adv.
電磁気学特論

【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: computational electromagnetics
The latter half: the special theory of relativity and the covariance of Maxwell's equations

【Grading】Submission of reports (twice)

【Course Goals】1. Understanding of computational methods for electromagnetic field analysis
2. Understanding of the basic concepts of special theory of relativity and the covariant formulation of Maxwell's equations

【Course Topics】

Theme	Class number of times	Description
Finite integration method for electromagnetic field analysis	4	- Introduction to finite integration method - Application to electromagnetic field analysis
Finite element method for magnetic field analysis	2-3	- Introduction to finite element analysis for magnetic field analysis - Edge element for three-dimensional magnetic field analysis
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

【Textbook】

【Textbook(supplemental)】Y. Kazama, Introductory Lectures on the Theory of Relativity (in Japanese), Baifukan,1997.

【Prerequisite(s)】Basic electromagnetic theory

【Web Sites】

【Additional Information】

10C613

Superconductivity Engineering

超伝導工学

【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】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C614

Biological Function Engineering
生体機能工学

【Code】10C614 【Course Year】Master Course 【Term】2nd term 【Class day & Period】Wed 2nd 【Location】

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

【Instructor】Tetsuo Kobayashi

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Basics of nervous system	3	
Neurones and glial cells	1	
Neuroimaging techniques	6	
Visual functions	3	
Auditory functions	1	
Motor functions	1	

【Textbook】

【Textbook(supplemental)】Tetsuo Kobayashi, Isamu Ozaki and Ken Nagata (eds.): "Brain topography and multimodal imaging", (Kyoto Univ. Press, 2009)

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C621

Applied Hybrid System Engineering

応用ハイブリッドシステム工学

【Code】10C621 【Course Year】Master Course 【Term】1st term 【Class day & Period】Wed 1st

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

【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.

【Web Sites】

【Additional Information】This course is held every two years.

10C625

Theory of Electric Circuits, Adv.
電気回路特論

【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

【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)】

【Web Sites】

【Additional Information】

10C631

Design of Control Systems

制御系設計理論

【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

【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

【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.

【Web Sites】(Info) http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/matlab-octave.html

【Additional Information】

10C616

Electric Power Transmission System
電力輸送システム

【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)】

【Web Sites】

【Additional Information】

10C611

Computer Simulations of Electrodynamics

電磁界シミュレーション

【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C612

Space Radio Engineering
宇宙電波工学

【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】Japanese

【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 reports

【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	6	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

【Textbook】

【Textbook(supplemental)】

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

【Web Sites】

【Additional Information】

10C617

Applied Microwave Engineering
マイクロ波応用工学

【Code】10C617 【Course Year】Master Course 【Term】1st term 【Class day & Period】Tue 4th

【Location】A1-101/Electrical Engineering Bldg.-Lecture Room (M)/Uji Campus 【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】(RISH) Shinohara

【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	1	Microwave processing, wireless communications, and radar texhnologies are explained.

【Textbook】Non. Hand out will be distributed.

【Textbook(supplemental)】

【Prerequisite(s)】Microwave engineering

【Web Sites】

【Additional Information】Number of the lectures may change.

10C714

Spacio-Temporal Media Analysis

時空間メディア解析特論

【Code】10C714 【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	
	1-2	
	2	
	1-2	
	1-2	
	1-2	
	2	
	1-2	
	0-2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C716

Visualized Simulation Technology
可視化シミュレーション学

【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	
	1	
	1-2	
	2-3	
	2-3	
	3-4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G021

Engineering Optics and Spectroscopy
光物理工学

【Code】10G021 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Wed 1st

【Location】Engineering Science Depts Bldg.-212 【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
	6	
	1	
	5	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C263

Physical Properties of Crystals Adv.
結晶物性学特論

【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)】

【Web Sites】

【Additional Information】

10C271

Magnetism and magnetic materials

磁性物理

【Code】10C271 【Course Year】Master and Doctor Course 【Term】2nd 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
	8	
	7	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10G203

Micro Process and Material Engineering

マイクロプロセス・材料工学

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

【Location】Engineering Science Depts Bldg.-216 【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	2	
Soft-micromachining	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10C074

Quantum Science

量子科学

【Code】10C074 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Fri 2nd

【Location】Bldg.No.1-Nuclear Engineering 2 【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

【Web Sites】

【Additional Information】

Molecular Materials
分子機能材料

【Code】10D413 【Course Year】Master and Doctor Course 【Term】(not held; biennially)

【Class day & Period】Wed 2nd 【Location】A2-304 【Credits】2 【Restriction】No Restriction

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】K. Tanaka and A. Ito

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	12	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D422

Molecular Materials Science

分子材料科学

【Code】10D422 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 1st

【Location】ICR N-338C 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture

【Language】Japanese 【Instructor】Kaji

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D007

Chemistry of Polymer Materials

高分子材料化学

【Code】10D007 【Course Year】Master Course 【Term】1st term 【Class day & Period】Fri 2nd

【Location】A2-302 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4	
	3	
	8	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D613

Polymer Structure and Function

高分子機能学

【Code】10D613 【Course Year】Master Course 【Term】1st term 【Class day & Period】Tue 2nd 【Location】

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

【Course Description】Polymers are indispensable in our modern society, fundamental in industry, and functional for chemistry, medicine, electronics, and many other advanced and emerging technologies. In this class, photo- and electric 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 real systems.

【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	
Photofunctional Polymers	5	
Nanostructure and Dynamics of Polymers	2	
Electronic Functions of Polymers	5	
Advanced Functionality of Polymers	2	

【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 of undergraduate.

【Web Sites】

【Additional Information】

10X011

Fundamentals of Quantum Optics

量子光学基礎論

【Code】10X011 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 2nd

【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)】

【Web Sites】

【Additional Information】

693637

Digital Signal Processing, Advanced
ディジタル信号処理論

【Code】693637 【Course Year】Master and Doctor Course 【Term】1st 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)】

【Web Sites】

【Additional Information】

693622

Digital Communication Engineering

ディジタル通信工学

【Code】693622 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Thu 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
	1	
	1	
	3-4	
	2	
	1	
	2-3	
	2-3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

693628

Information Network

情報ネットワーク

【Code】693628 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Tue 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】http://www.i.kyoto-u.ac.jp/curriculum/syllabus.html

10X009

Recent Advances in Interdisciplinary Photonics and Electronics
融合光・電子科学通論

【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)】

【Web Sites】

【Additional Information】

10X015

Advanced Seminar in Interdisciplinary Photonics and Electronics Ⅰ，Ⅱ

融合光・電子科学特別研修 1(ｲﾝﾀｰﾝ)

【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)】

【Web Sites】

【Additional Information】

10X017

Advanced Seminar in Interdisciplinary Photonics and Electronics Ⅰ, Ⅱ

融合光・電子科学特別研修 2(ｲﾝﾀｰﾝ)

【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)】

【Web Sites】

【Additional Information】

10X019

Research Internship (M,D)

研究インターンシップ M(融合光)

【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)】

【Web Sites】

【Additional Information】

10X021

Research Internship (M,D)

研究インターンシップ D(融合光)

【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)】

【Web Sites】

【Additional Information】

10X023

Advanced Exercises on Interdisciplinary Photonics and Electronics I, II

融合光･電子科学特別演習 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)】

【Web Sites】

【Additional Information】

10X025

Advanced Exercises on Interdisciplinary Photonics and Electronics I, II

融合光･電子科学特別演習 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)】

【Web Sites】

【Additional Information】

10D051

Frontiers in Modern Science & Technology

現代科学技術の巨人セミナー「知のひらめき」

【Code】10D051 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Wed 5th

【Location】Katsura Hall 【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	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10D040

Exercise in Practical Scientific English

実践的科学英語演習「留学ノススメ」

【Code】10D040 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】 【Location】

【Credits】1 【Restriction】 【Lecture Form(s)】Seminar 【Language】English

【Instructor】Kim Sunmin, Kenji Wada. etc

【Course Description】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Grading】Attendance 60%, midterm reports 20%, final report 20%. The final report must be submitted by the deadline date.

【Course Goals】This course is designed to develop high-level communication and presentation skills in English required for top level scientific and industrial career prospects.

【Course Topics】

Theme	Class number of times	Description
Introduction	2	Course Guidance, etc.
Exercise-1	1	Definition of technical writing 3C in technical writing Weaknesses of Japanese writers Good examples and bad examples
Exercise-2	1	Punctuation Presentation skills 1 -organization
Exercise-3	1	Organizing your thoughts for the title and abstract Presentation skills 2 ?Visual aspects
Exercise-4	1	Presenting the background of your research Presentation skills 3 ?Oral Aspects
Exercise-5	1	Describing how you did your research Presentation skills 4 ?Physical Aspects
Exercise-6	1	Presenting what you observed Presentation Practice
Exercise-7	1	Placing your findings in the field Presentation Practice
Exercise-8	1	Expressing thanks and listing references Presentation practice
Exercise-9	1	Writing your proposal Presentation practice
Exercise-10	1	Presentation practice Reviews & Feedbacks Evaluation
Presentation	2	Current situation of studying abraod, etc.
Wrap-up lecture	1	Achievement Assessment

【Textbook】No textbook is required.

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】http://www.ehcc.kyoto-u.ac.jp/alc/ (needs passwords).

【Additional Information】For details, contact Dr. Wada (wadaken@scl.kyoto-u.ac.jp).

10K001

Introduction to Advanced Material Science and Technology（English lecture）

先端マテリアルサイエンス通論（英語科目）

【Code】10K001 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Friday,4th-5th 【Location】KatsuraA2-308,Yoshida Research Bldg.No4,-Room3(Distance lectures) 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Relay Lecture 【Language】English 【Instructor】

【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】In order to obtain two credits, students must attend at least ten lectures, and at least five of the submitted reports must be evaluated as “ passed ” by each lecturer. Each report should be submitted to the lecturer within two weeks after his/her lecture. NOTE: Reports are NOT acceptable from those who do not attend the lecture.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	Hyperthermophiles and their thermostable biomolecules H. Atomi
	1	Microreactor Technology for Production of High Functional Chemical Materials K.Mae
	2	Advanced Beam Processes and Characterization Technique for Nanotechnology J.Matsuo
	2	Chemical vapor deposition － Synthesis of advanced materials from gas phase M.Kawase
	1	Nanostructure Control in Structural Metallic Materials N.Tsuji
	1	Nano-optical Spectroscopy/Microscopy:Applications in Material Science H.Aoki
	1	Photonic Materials K.Hirao
	1	ISO Standards in Analytical Chemistry J. Kawai
	1	Electrodeposition and Electroless Deposition for Materials Processing K. Murase
	2	Bio-inspired Biomaterials H.Akiyoshi
		Confirmation of study achievement

【Textbook】None

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】Check the notice on the bulletin board.

Human Security Engineering
人間安全保障工学概論

【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)】
【Web Sites】http://hse.gcoe.kyoto-u.ac.jp/en/inside/kyomu/index.html
【Additional Information】

Urban Governance
都市ガバナンス論

【Code】10X303 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Fri 3rd 【Location】

【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】English

【Instructor】MONNAI Teruyuki, KANKI Kiyoko, KOBAYASHI Masami, SHAW Rajib, FURUSAKA Shuzo

【Course Description】The key to raising the human quality of life lies in well-designed cities that make good use of human and physical resources. In this course, we will explore the methodology of urban governance, including bottom-up decision making based on collaboration of various actors, in order to solve the multi-dimensional human security problems of safety, health, convenience, comfort, amenity, and sustainability. Moreover, multiple lecturers will provide interesting topics of urban governance, with concrete problems for students to discuss.

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Lectures in Urban Governance 1

都市ガバナンス学各論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)】

【Web Sites】

【Additional Information】Tailor-made lectures by supervisor

Lectures in Urban Governance 2

都市ガバナンス学各論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)】

【Web Sites】

【Additional Information】Tailor-made lectures by supervisor

10X309

Global Environmental Law and Policy

地球環境法・政策論

【Code】10X309 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Wed 2nd 【Location】 【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】English 【Instructor】MATSUSHITA Kazuo, OBATA Fumiko

【Course Description】The course will examine the legal and institutional framework of global environmental policy as well as the activities of various actors including governments, international organizations, businesses and civil society.

【Grading】Students will be evaluated principally by class presentations as well as an end-of-term report, taking active and constructive participation in the class into account.

【Course Goals】The objective of this course is to identify ways and means to create global benefits and realize sustainable societies.

【Course Topics】

Theme	Class number of times	Description
Introduction and Explanation of Course Outline	1	
Stockholm to Rio	1	
Rio to Johannesburg	1	
Environmental Accords	1	
The Ozone Layer Protection and Climate Change Regimes	1	
The UN Systems, Development Assistance and the Environment	1	
Civil Society and Governance without Government	1	
	1	
Outline of the Japanese Environmental Law	1	
Corporate Social Responsibility	1	
Smoking Regulations in Japan	1	
Basic Environmental Law, Air Pollution Control Law, Environmental Impact Assessment Law	4	

【Textbook】Speth, J.G., and Haas, P.M., Global Environmental Governance, Island Press, 2006
松下和夫「環境政策学のすすめ」丸善株式会社，2007 年
松下和夫「環境ガバナンス」岩波書店，2002 年
環境省ホームページ　http://www.env.go.jp/en/lar/lar-index.html

【Textbook(supplemental)】WCED, Our Common Future, Oxford University Press, 1997
UNEP, Global Environment Outlook(GEO)4, 2007
UNEP, Global Environment Outlook(GEO)3, Earthcan, 2002
Elliot, Lorraine, The Global Politics of the Environment, Macmillan Press Ltd, 1998
World Watch Institute, State of the World, Norton, annual publications
ワイツゼッカー,「地球環境政策」有斐閣，1994
ガレット・ポーター他,「入門地球環境政治」有斐閣，1998
松下和夫,「環境政治入門」平凡社新書，2000
松下和夫編・著,「環境ガバナンス論」京都大学学術出版会，2007
松井三郎編,「今なぜ地球環境か」コロナ社，2002
亀山康子,「地球環境政策」，昭和堂，2003
蟹江憲史,「環境政治学入門ー地球環境問題の国際的解決へのアプローチー」，丸善株式会社，2004
倉坂秀史,「環境政策論」，信山社，2004

【Prerequisite(s)】

【Web Sites】

【Additional Information】Students are divided into several groups. Each group is required to make presentations in the class on assigned subjects.

10X311

Urban Infrastructure Management
都市基盤マネジメント論

【Code】10X311 【Course Year】Master and Doctor Course 【Term】1st term 【Class day & Period】Mon 3rd

【Location】C1-117 【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 viewpoint of not only economy but also "human security engineering". In detail, the contents of lectures consist of following topics:
Urban Infrastructure Asset Management,
Urban Environment Accounting System,
Urban Energy Supply Management,
Urban Food/Water Supply Management,
Urban Transport/Logistics Management.

【Grading】Participation(10), Presentation(50), Report(40)

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Guidance, Introduction of Urban Infrastructure Asset Management	2	
Urban Infrastructure Asset Management	3	
Urban Transport/Logistics Management	3	
Urban Environment Accounting System	2	
Urban Food/Water Supply Management	2	
Urban Energy Supply Management	2	
Presentation	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Governance for Regional and Transportation Planning

地域・交通ガバナンス論

【Code】10X313 【Course Year】Master and Doctor Course 【Term】2nd term 【Class day & Period】Tue 4th 【Location】C1-171 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】English 【Instructor】KOBAYASHI Kiyoshi

【Course Description】This lecture aims to provide interdisciplinary knowledge associated with appropriate governance strategies for regional, urban, transportation planning. In detail, the contents of lectures consist of following topics: Urban development management based upon PPP, landscape design to support activities, public transportation system for sustainable growth, urban facilities planning considering the variety in behaviors, ITS to support highly-advanced transportation behavior, advanced logistic system, and remote sensing technology for urban and regional planning

【Grading】Participation (30), Report (70)

【Course Goals】To achieve the knowledge for urban and regional governance.

【Course Topics】

Theme	Class number of times	Description
Introduction of Urban Infrastructure Management	1	Prof. Kobayashi
New Settlement Systems for Transportation Services	1	Assoc. Prof. Matsushima
Landscape Policy of Kyoto City	1	Assoc. Prof. Kubota
Urban Design Considering Amenity in the River-Front	1	Prof. Kawasaki
Concepts and visions for city logistics	2	Prof. Taniguchi and Assoc. Prof. Yamada
Expectations for ITS and issues	1	Assoc. Prof. Uno
Mobility Management	2	Prof. Fujii
Disaster Risk Governance	1	Assoc. Prof. Yokomatsu
Concepts and visions for city logistics	3	Assoc. Prof. Susaki, Assic. Prof. Maki, and Dr. Suanpaga (Kasetsart Univ.)
Traffic modeling with Digital Image Processing	1	Dr. Suanpaga (Kasetsart Univ.)
Summary	1	Summarize classes and check whether students could understand them.

【Textbook】None

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10X315

Lectures in Urban Infrastructure Management 1

都市基盤マネジメント学各論 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)】

【Web Sites】

【Additional Information】

Lectures in Urban Infrastructure Management 2

都市基盤マネジメント学各論 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)】

【Web Sites】

【Additional Information】

10X319

Global Environmental Economics
地球環境経済論

【Code】10X319 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Mon 2nd 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】English 【Instructor】UETA Kazuhiro, MORI Akihisa

【Course Description】Lectures will be given on the theory and policy of sustainable development in view of environmental/ecological economics. In particular the focus will be on:
- Reconstructing relations between humans and nature, taking environmental constraints, material cycles, efficiency, equity and sustainability into account
- Clarify socio-economic mechanisms of global and local environmental problems and policies and measures to deal with them
- Valuing the environment and evaluating the policies and institutions that cause current environmental problems

The lecure will then discuss multi-level environmental governance that enables to manage local and global common-pool resources and/or environmental assets, to finance for sustainable development.

【Grading】Evaluated mainly by end-of-term examination scores, taking active and constructive participation in the class into account.

【Course Goals】To aquire basic theory and methodology on global environmental economics and policies, and economics of sustainable development.

【Course Topics】

Theme	Class number of times	Description
Introduction: Economics and the Environment	1	
Topics and Challenges of Environmental Economics	1	
Sustainable Development: Economics of Environment and Development	1	
Theory of Environmental Valuation and Decision Making	1	
Environmental Policy: Goals, Instruments and Actors	1	
Environmental Policy Instruments	1	
Environmental Policy Integration	1	
Environmental Policy Innovation, Diffusion and Technological Innovation	1	
International Trade, FDI and the Environment	1	
Inernational Environmental Aid and Financial Mechanisms for Global Environment	1	
Poverty and Environment	1	
Economic Development and Environmental Policy in East Asia	1	
	1	
	2	

【Textbook】植田和弘,「環境経済学」, 岩波書店, 1996
諸富・浅野・森,「環境経済学」, 有斐閣, 2008

【Textbook(supplemental)】Dasgupta, Partha, 2007. Economics: A Very Short Introduction. Oxford: Oxford University Press
Adams, William M., Green Development: Environment and Sustainability in a Developing World. 3rd Edition. London: Routledge.
Kerry Turner, David Pearce and Ian Batemen, 1994. Environmental economics: An Elementary Introduction. Pearson Education Limited.
Atkinson, Giles, Simon Dietz and Eric Neumayer (eds.) 2007. Handbook of Sustainable Development. Cheltenham; Edward Elgar.
Maler, Karl-Goran and Jeffery R. Vincent (eds.) 2003. Handbook of Environmental Economics Vol.1: Environmental degradation and Institutional Responses. Amsterdam: Norh-Holland.
Dasgupta, Partha, Human Well-Being and the Natural Environment. Oxford: Oxford University Press
Jordan, Andrew J. and Andrea Lenschow, 2008. Innovation in Environmental Policy? Integrating the Environment for Sustainability. Cheltenham: Edward Elgar.
日本環境会議「アジア環境白書」編集委員会（編),「アジア環境白書 2006/07」, 東洋経済新報社, 2006
岩波講座　環境経済・政策学, 第 1-8 巻, 岩波書店
淡路・川本・植田・長谷川（編),「リーディングス環境」1-5 巻, 有斐閣

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10X321

Lecture on Environmental Management Leader

環境リスク管理リーダー論

【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)】

【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

健康リスク管理学各論 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)】

【Web Sites】

【Additional Information】

Lectures in Health Risk Management 2

健康リスク管理学各論 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)】

【Web Sites】

【Additional Information】

10X327

Environmental Engineering for Asia

アジア環境工学

【Code】10X327 【Course Year】Doctor Course 【Term】2nd term 【Class day & Period】 【Location】C1-171

【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】English

【Instructor】SHIMIZU Yoshihisa, FUJII Shigeo, TSUNO Hiroshi, TANAKA Hiroaki, MATSUOKA Yuzuru, TAKAOKA Masaki, KURATA Gakuji

【Course Description】The course is a simultaneously conducted distance-learning conducted at Kyoto University, and from remote lecture stations in the University of Malaya, and Tsinghua University. A hybrid system is used for this distance learning, which consists of prerecorded lecture videos, VCS (Video Conference System) and SS (Slide Sharing System). The students are requested to give short presentations in English at the end of the lecture course. This course seeks to improve students' English skills and international senses through lectures, presentations, and discussions.

【Grading】Evaluation by class attendance, Q&A and presentations.

【Course Goals】This course covers, in English, various kinds of engineering issues related to water environments, atmospheric environment and solid waste management, encompassing fundamental knowledge, the latest technologies and regional application examples. These lectures, together with English presentations by students, and discussions enhance the English capability and internationality of students.

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】Either "New Environmental Engineering I, advanced" or "New Environmental Engineering II, advanced" will be acceptable as corresponding to this course. PowerPoint slides are the main teaching materials in the lectures, and hard copies are distributed to the students. In addition, a list of technical terms and difficult English words will be given to the students with their explanations and Japanese translations.

Management of Global Resources and Ecosystems

地球資源・生態系管理論

【Code】10X329 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Fri 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
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

10X331

Environmental Ethics and Environmental Education

環境倫理・環境教育論

【Code】10X331 【Course Year】Doctor Course 【Term】1st term 【Class day & Period】Tue 5th 【Location】C1-171 【Credits】2 【Restriction】【Lecture Form(s)】Lecture 【Language】English 【Instructor】FUJII Shigeo, TANIGUCHI Fumiaki, SUGIMOTO Kazuo

【Course Description】Ethical approaches and educational activities are essential for solving environmental problems, especially to facilitate consensus-building among conflicting stakeholders. This lecture, provides the principles of environmental education, the relationship between education and ethics, the chemical management of chemical substances, the ISO14000 series and some case studies. Students will join the class not only by auditing, but also by discussion and presentations.

【Grading】Several reports and group presentation.

【Course Goals】The objectives of this lecture are to study the "Environmental Ethics" that are essential to the recognition of environmental problems, and to consider the "Environmental Education" that is it necessary to provide to the public.

【Course Topics】

Theme	Class number of times	Description
Environmental ethics overview	1	
Goal of environmental education and categories of environments of nature, society and mind	1	
Pedagogy of environmental education based on environmental philosophy	1	
Environmental education oriented by environmental ethics	1	
Case studies of environmental education	1	
Solutions for global environmental issues through environmental education	1	
Precautionary principles, focusing on hazardous chemical problems	1	
ISO 14000 series	1	
Group discussion on environmental ethics/education	1	
Group presentation about environmental ethics/education	1	
	1	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Disaster Risk Management

災害リスク管理論

【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
【Web Sites】No web site
【Additional Information】

10X335

Lectures in Disaster Risk Management 1

災害リスク管理学各論 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)】

【Web Sites】

【Additional Information】

10X337

Lectures in Disaster Risk Management 2

災害リスク管理学各論 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)】

【Web Sites】

【Additional Information】

10X339

Internship for Human Security Engineering

人間安全保障工学ｲﾝﾀｰﾝｼｯﾌﾟ

【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)】

【Web Sites】

【Additional Information】

Advanced Capstone Project

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【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)】

【Web Sites】

【Additional Information】

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・[B] Master's Program
・[C] Advanced Engineering Course Program
・[D] Interdisciplinary Engineering Course Program
・**オンライン版**　http://www.t.kyoto-u.ac.jp/syllabus-gs/

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