SYLLABUS *2018*

[C] Engineering Science

Kyoto University, Faculty of Engineering

[C] Engineering Science

Engineering Science

51240

Internship

インターンシップ

【Code】51240 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Exercise 【Language】Japanese 【Instructor】,

【Course Description】The aim of the internship is experiencing on-site activities involved production, manufacturing, development, designing and research of industrial goods at a factory or a research laboratory of Japanese leading companies. On-site learning of the importance of teamwork and production processes in manufacturing is also the aim.

【Grading】Credits (2) are approved based on the summary report and presentation about the internship activities.

【Course Goals】The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, by learning the relationship between a human and machines at an industry, motivate oneself to study and think about one's career development.

【Course Topics】

Theme	Class number of times	Description
		As a general rule, the internship should meet the above purpose. The duration should be not less than two weeks. Thus, the following cases are not approved as an internship; a short internship such as a week, a company tour, a company explanation meeting and so on. Longer term more than two weeks and an overseas internship such as IAESTE can be acceptable.
		Based on recruitment from companies. You can find them at company’s web sites and/or the instruction section of the Engineering Science office (Butsuri Kyoumu).

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】Pre-registration at the instruction section of the Engineering Science office (Butsuri Kyoumu) is required.

51241

Internship

インターンシップ

【Code】51241 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【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】

51570

Design Practice and Experiments for Applied Energy Science 1

エネルギー応用工学設計演習・実験１

【Code】51570 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】3 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	6	
	6	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51590

Design Practice and Experiments for Applied Energy Science 2

エネルギー応用工学設計演習・実験２

【Code】51590 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】3 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	6	
	6	
	6	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51390

Energy chemistry 1

エネルギー化学１

【Code】51390 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】Fundamental chemistry such as quantum chemistry, solid state chemistry, physical chemistry will be described in this course for deeper understanding of energy conversion and applications. Especially chemical bonding and structures and their energetics will be discussed in this course.

【Grading】Overall evaluation of the activity in the class, homework, and term-end exam

【Course Goals】Deeper understanding of energy conversion and applications from the viewpoint of chemistry

【Course Topics】

Theme	Class number of times	Description
Atomic structure	2	Understanding of fundamentals of inorganic chemistry such as atomic orbital, electronic structure of many-electron atoms, atomic radii, ionic radii, lanthanide contraction, ionization potential, electron affinity and electronegativ.
	3	Understanding of fundamentals of inorganic solid state chemistry such as crystal lattice, symmetry of crystal, close packing structure, metals, alloys, intermetallic compounds, ionic crystals and covalent crystals
	2	The factors such as ionic radii, coordination number, lattice energy affecting the crystal structure will be described. Thermochemistry of solid compounds will be discussed.
	3	Chemical bonding theory and energetics such as Lewis structure, resonance structure, valence bond theory, molecular geometry and VSEPR theory, hybridization orbital, molecular orbital, bond length, bonding radii, bond energy will be described.
	2	Symmetry operation and symmetry elements, molecular point groups will be described. Applications to molecular orbitals, molecular vibration, vibrational spectroscopies will be discussed.
	3	Concepts and theory of Bronsted acids and bases, Lewis acids and bases, their reactions, solvent effects will be described. Learning achievement evaluation will be made in the last class.

【Textbook】Shriver & Atkins' Inorganic Chemistry, the 6th ed., Oxford University Press.

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】Homeworks will be occasionally assigned as supplementary exercises. Depending on the progress in the class, schedule may be partially changed. Homeworks and supplementary materials are provided at URL:http://www.echem.energy.kyoto-u.ac.jp The text book will be used in Energy chemistry II held in fall semester.

51400

Energy chemistry 2

エネルギー化学２

【Code】51400 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】The lecturer teaches fundamental matters in inorganic chemistry related to energy conversion and storage. In particular, Redox reactions, analytical methods, molecular geometries, and coordination chemistry as well as electrochemical energy conversion devices will be lectured.

【Grading】Evaluation will be based on assignments (every week) and final examination.

【Course Goals】Understanding fundamental matters on energy conversion and utilization related inorganic chemistry as well as their relations to daily life and state-of-the-art researches

【Course Topics】

Theme	Class number of times	Description
Oxidation and Reduction	3	reduction potentials, redox stability, diagrammatic presentation of potential data, chemical extraction of the elements
Molecular symmetry	2	an introduction to symmetry analysis, applications of symmetry, symmetries of molecular orbitals, representations
An introduction to coordination chemistry	2	language of coordination chemistry, constitution and geometry, isomerism and chirality, thermodynamics of complex formation
Physical techniques in inorganic chemistry	3	diffraction methods, absorption spectroscopy, resonance techniques, ionization-based techniques, chemical analysis, magnetometry, electrochemical techniques, microsope techniques
Periodic trends, Hydrogen, Group 1 and 2elements	2	periodic properties, periodic characteristics of compounds, hydrogen, alkali metal, and alkali earth metal compounds, topics related to energy chemistry (hydrogen energy system, secondary batteries)
Group 13, 14, 15, and 16 elements	2	boron, aluminium, carbon, silicon, nitrogen, and chalcogen compounds, topics related to energy chemistry (carbonaceous materials, solar cells, energy resources)
Exercises and comments	1	Exercises and comments on the topics in this lecture

【Textbook】Shriver & Atkins' Inorganic Chemistry (6th Ed.) ISBN 9784807908981 which is used in Energy Chemistry 1.

【Textbook(supplemental)】

【Prerequisite(s)】Students are supposed to understand the lecture "Energy Chemistry 1".

【】

【Web Sites】

【Additional Information】Assignments are given every week to support understanding of the lecture.

51180

Thermochemistry for Energy and Materials Science 1

エネルギー・材料熱化学 1

【Code】51180 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】Hirato, Hasegawa,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51190

Thermochemistry for Energy and Materials Science 2

エネルギー・材料熱化学２

【Code】51190 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】 【Language】Japanese 【Instructor】Hirato, Hasegawa,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50230

Energy Conversion

エネルギー変換工学

【Code】50230 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Ishiyama (Grad. School of Energy Science) Nakabe (Grad. School of Engineering)

【Course Description】Various energy sources and energy conversion systems will be outlined. Also, basic matters on energy conversion processes and thermodynamics treatments for the effective use of energy will be lectured.

【Grading】Achievement will be synthetically evaluated from attendance, report and final examination.

【Course Goals】From this class, fundamental issues related to energy conversion engineering are learned, as well as a target is put in the current situation of energy resources, latest technologies of energy conservation and new energy system, environmental measures are comprehensible.

【Course Topics】

Theme	Class number of times	Description
Energy source and energy conversion system	3 〜 4	* Energy resources
	3 〜 4	
	3 〜 4	
	3 〜 4	

【Textbook】Nothing. Print material is properly distributed.

【Textbook(supplemental)】It will be introduced, if necessary.

【Prerequisite(s)】Knowledge of thermodynamics is required.

【】

【Web Sites】

【Additional Information】

50231

Energy Conversion

エネルギー変換工学

【Code】50231 【Course Year】3rd year 【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	
	4	
	2	
	3	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

53000

Introduction to Elecronics

エレクトロニクス入門

【Code】53000 【Course Year】 【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	
	5	
	2	
	5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50130

Applied Electromagnetism

応用電磁気学

【Code】50130 【Course Year】3rd year 【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 ～ 3	
	3 ～ 4	
	2 ～ 4	
	3 ～ 5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51140

Fundamentals of Nuclear Physics

核物理基礎論

【Code】51140 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Miyadera, Ogure,

【Course Description】

【Grading】examination

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Properties of nuclei	2	
Mass formula of nuclei	2	
Structure of nuclei	6	
Alpha decays and fission	2	
Beta decays	2	
Confirmation of achievement in study	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51150

Particle Accelerators

加速器工学

【Code】51150 【Course Year】3rd year 【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	
	3	
	2	
	2	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51310

Exercise on Mechanical System Engineering

機械システム学演習

【Code】51310 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

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

【Course Description】This seminar provides exercise on various topics in mechanical engineering. Students should register in advance (in July).

【Grading】Depends on topics.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51690

Seminar on Mechanical System Engineering

機械システム学セミナー

【Code】51690 【Course Year】3rd year 【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】

50560

Mechanical and System Engineering Laboratory 1

機械システム工学実験１

【Code】50560 【Course Year】3rd year 【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
	1	
	2	
	2	
	2	
	2	
	2	
	1	
	1	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50570

Mechanical and System Engineering Laboratory 2

機械システム工学実験２

【Code】50570 【Course Year】3rd year 【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
	1	
	2	
	2	
	2	
	2	
	2	
	1	
	1	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50580

Mechanical and System Engineering Laboratory 3

機械システム工学実験３

【Code】50580 【Course Year】3rd year 【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
	1	
	14	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50610

Exercise for Machine Shop Practice

機械製作実習

【Code】50610 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】1

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

【Instructor】Nakabe, Matsubara, Nishiwaki, Kouno and guest lecturers

【Course Description】This course consists of two parts: machine shop training and special lectures by visiting lecturers. The machine shop training will be offered for a week in August or September (during summer break). Students will learn the operation of various machine tools, e.g. a lathe, a milling machine, and a drilling machine, to make a stirling engine, whose performance will be tested at the end of the course. Hands-on training of disassembly and re-assembly of a commercial diesel engine (or a gasoline engine) will be also offered to learn actual engine mechanism.

The seminar series will be offered in the 2nd semester. Professional engineers from various companies will be invited to give a lecture on real-world experience on production design, manufacturing, or management.

【Grading】For the credit, students are in principle required to participate in all the classes, and to submit all the reports.

【Course Goals】To experience turning, milling and drilling operations and other basic machining operations. To obtain basic knowledge and experience on machine tools, cutting tools, measurement, and machining accuracy by hands-on training.

【Course Topics】

Theme	Class number of times	Description
Lectures on principle of engines	1	Students will learn basic knowledge on the priciple of a stirling engine and a diesel (gasoline) engine.
Lectures on machine tools	1	Students will learn basic knowledge on machine tools that they will use in machine shop training.
Machine shop training (making a stirling engine)	4	Turning operation for cylindrical parts (2 classes), milling and drilling operations (2 classes), assembly and evaluation (1 class). A group of two students will make one stirling engine.
Disassembly of an engine	1	Assebly and disassembly of a commercial diesel (or gasoline) engine.
Lectures on safety	1	A special lecture on safety issues in manufacturing process and product design by a visiting lecturer.
Special seminars	7	Special seminars by visiting lecturers. Lectures may be subject to change each year. Examples of past lectures: "To future Edison -- save the world by good idea and engineering," "Development of compressors to meet market's needs -- role of mechanical engineers," "Japanese machine tools for the world's manufacturing - key technologies," "Engineer's life in companies."
Factory tour	1	One-day trip to a factory in Kansai area.

【Textbook】A textbook will be handed out in class.

【Textbook(supplemental)】None.

【Prerequisite(s)】None.

【】

【Web Sites】None.

【Additional Information】The class overview will be presented in a guidance class for 2nd year students in Undergraduate Course Program of Mechanical and Systems Engineering in April. Detailed schedule will be given then.

Please be aware -- a large part of this class will be offered during the summer break.

A class guidance will be given typically in July. Its announcement will be posted in the 1st floor of the building of Dept. of Engineering Science. All the students who want to take this class must come to this guidance.

50590

Exercise of Machine Design 1

機械設計演習 1

【Code】50590 【Course Year】3rd year 【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
	4	
	3	
	-	
	21	
	21	
	21	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50600

Exercise of Machine Design 2

機械設計演習 2

【Code】50600 【Course Year】3rd year 【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
	14	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51270

Design and Manufacturing Processes

機械設計製作

【Code】51270 【Course Year】2nd year 【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
	3	
	4	
	7	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50450

Gasdynamics

気体力学

【Code】50450 【Course Year】3rd year 【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	
	2	
	2	
	1	
	3	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50690

Metallic Materials

金属材料学

【Code】50690 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Nobuhiro Tsuji,

【Course Description】

【Grading】Attendance, exercises, home-works and exam.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Outline of Lecture	1	
Microstructure Evolution in Cast Alloys	2	
Deformation, Recovery, Recrystallization and Grain Growth	3	
	3	
Heat Treatment in Steels	5	
Summary	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】http://www.tsujilab.mtl.kyoto-u.ac.jp/01TsujiLab/Education/StructMetalMater/

【Additional Information】

50470

Aerodynamics

空気力学

【Code】50470 【Course Year】3rd year 【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
	2	
	2	
	1	
	3	
	3	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50030

Mathematics for Computation

計算機数学

【Code】50030 【Course Year】2nd year 【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
	2	
	2	
	3	
	4	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50090

Scientific Measurement

計測学

【Code】50090 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Osamu Tabata, Ryuji Yokokawa, Katsuyuki Kinoshita, Toshiyuki Tsuchiya, Masao Miyake,

【Course Description】Basics of scientific insturmentaion is covered.

【Grading】Examination. Reports are considered also.

【Course Goals】Understanding of the basics of scientific instrumentation in engineering physics.

【Course Topics】

Theme	Class number of times	Description
Units and Standards	2	Units and Standards
Measurement uncertainity and its evaluation	3	Measurement uncertainity and its evaluation
Data processing and statistical analysis	3	Data processing and statistical analysis
Electrical and tempeature measurement	2	Electrical and tempeature measurement
Radiation and material measurement	2	Radiation and material measurement
Mechanical measurement	2	Mechanical measurement
level of attainment	1	level of attainment

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

52330

Xray Diffraction

結晶回折学

【Code】52330 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese
【Instructor】Faculty of Engineering, Professor, Matsubara Eiichiro
【Course Description】Structural analyses by X-ray diffraction method will be given. In the lecture, the properties of X-rays, X-ray diffraction phenomena, crystallography, and diffraction by powder samples will be lectured.
【Grading】The course will be graded by the scores of about 5 mini tests during classes (40%) and a final test (60 %).
【Course Goals】Students will learn the crystal structure analyses by X-rays through the course works of X-ray properties, crystalline structures, diffraction conditions, and reciprocal lattices.
【Course Topics】

Theme	Class number of times	Description
Basic properties of x-rays	2-3	1.X-rays 2.Continuous x-rays 3.Characteristic x-rays 4.X-ray absorption 5.X-ray filter 6.Generation of x-rays
Crystallography	2-3	1.One dimensional crystal symmetry 2.7 crystal systems and 14 Bravais' lattices 3. Practical examples of crystals 4. Body-centered cubic, face-centered cubic and hexagonal close-packed lattices 6. Crystalline structures of several compounds
Description of crystal planes and directions	1-2	1. Description of lattice planes and directions 2. Stereo projection
Diffraction by crystals	2	1. Diffraction by crystalline lattice 2. Bragg conditions and scattering angle 3. Calculation of structure factors
Diffraction by a powder sample	2	1. Principle of diffractometer 2. X-ray diffraction by powder sample
Structural analyses of cubic systems	2	1. Determination of a lattice parameter in cubic systems 2. Determination of Bravais' lattice in cubic systems
Reciprocal lattice and diffraction condition	2-3	1. Definition of reciprocal lattices 2. Reciprocal lattice and real lattice 3. Reciprocal lattice and diffraction condition

【Textbook】
【Textbook(supplemental)】
【Prerequisite(s)】
【】
【Web Sites】
【Additional Information】

50350

Physics of Crystal Properties and Imperfections

結晶物性学

【Code】50350 【Course Year】3rd year 【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
Introduction to dislocations	1	
Basics of elasticity theory	5	
Properties of dislocations	2	
	2	
	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51580

Nuclear Engineering Laboratory 1

原子核工学実験１

【Code】51580 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】3 【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	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51600

Nuclear Engineering Laboratory 2

原子核工学実験２

【Code】51600 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】3 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51500

Introduction to Nuclear Engineering 1

原子核工学序論 1

【Code】51500 【Course Year】2nd year 【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
	7	
	7	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51510

Introduction to Nuclear Engineering 2

原子核工学序論２

【Code】51510 【Course Year】2nd year 【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	
	9	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50140

Atomic Physics

原子物理学

【Code】50140 【Course Year】2nd year 【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	
	2	
	2	
	3	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51070

Basic Nuclear Reactor Exercise and Experiments

原子炉基礎演習・実験

【Code】51070 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】Basic reactor physics experiments using Kyoto University Critical Assembly (KUCA) which is a small and low power reactor are carried out. Guidance and lectures before experiments are perfomed at Yoshida main campus, and experiments are perfomed at Research Reactor Institute (Osaka Kumatori-cho).

【Grading】reports before and after experiments

【Course Goals】Understanding nuclear characteristics and safety system of nuclear reactor through reactor physics experiments

【Course Topics】

Theme	Class number of times	Description
Guidance	6	Guidance and lectures for experiments are performed at Yoshida main campus.
Experiment	1	Experiments are performed at Research Reactor Institute (Kumatori-cho, Osaka) for 1 week. 1) guidance 2) criticality approarch experiment 3) control rod caribration experiment 4) neutron flux measurement experiment 5) operation of nuclear reactor

【Textbook】Download from Web site (Japanese, English and Korean versions are available)

【Textbook(supplemental)】

【Prerequisite(s)】Basic knowledge about reactor physic

【】

【Web Sites】

【Additional Information】1) Registration to workers for radioactive material treatment is required before experiment.
2) English course for this experiment is opened.

52030

Nuclear Reactor Physics

原子炉物理学

【Code】52030 【Course Year】3rd year 【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	
	4	
	3	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

20500

Applied Mathematics A1

工業数学 A1

【Code】20500 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】mitsuru shibayama

【Course Description】Complex analysis.

【Grading】Evaluation depends mainly on marks of examination, but marks of exercises are taken into account when needed.

【Course Goals】To understand properties of complex functions with a skill for evaluation of integrals appearing in applied mathematics and physics.

【Course Topics】

Theme	Class number of times	Description
Complex numbers and the complex plane	2	Complex numbers and the complex plane are introduced.
Complex functions and the regularity	3	Complex functions are introduced and the regularity of complex functions are explained.
Contour integrals of analytic functions	3	Contour integral of analytic functions are stated. Cauchy's theorem and formula are explained.
Laurent series and the residue theorem	3	Laurent expansion that is power series around isolated singularities is explained. The calculus of residues and the residue theorem are also explained.
Integral calculations	3	Some integral calculations using Cauchy's theorem and the residue theorem are shown.
Feedback	1	After the final exam, answers is open. Students study it themselves.

【Textbook】

【Textbook(supplemental)】Y. Iso, Introduction to complex functions, SAIENSU-SHA (Japanese)

【Prerequisite(s)】Calculus, Linear algebra

【】

【Web Sites】KULASIS

【Additional Information】

Applied Mathematics A2

工業数学 A2

【Code】20600 【Course Year】 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Nakamura Yoshimasa, Tsujimoto Satoshi

【Course Description】"Numerical Analysis" is prerequisite to this course. In this course matrix eigenvalue problem and singular value decomposition, iteration methods for nonlinear equations, interpolation methods by polynomials, and numerical integration methods are explained which are important especially in data science and information processing. *There is a possibility to replace Course Topics. Detail will be announced at the first class.

【Grading】mainly evaluated by examination score, but reports of exercises will be taken into account in a case.

【Course Goals】Understanding both the theory and practical methods for applications through general-purpose softwares and/or programs by each student is a goal of this course.

【Course Topics】

Theme	Class number of times	Description
matrix eigenvalue problem	6	computation of matrix eigenvalues and eigenvectors by the Jacobi method, Gershgorin theorem, the power method and the inverse iteration, the QR method and the divide & conquer method with the Householder transformations for preprocessing, Sturm theorem
matrix singular value decomposition	1	computation of matrix singular value decomposition
iterative methods for nonlinear equations	3	the principle of contractive mapping and the Newton method both of one and multi variables, and convergence acceleration algorithms
interpolation methods	2	the Lagrange interpolation formula and the Hermitian interpolation formula by polynomials, and the spline functions
numerical integration methods	2	Newton-Cotes numerical integration formula,and the Gauss type numerical integration formula
confirmation for student assessment	1	confirmation for each student assessment
	1	

【Textbook】"Introduction of Numerical Analysis" (in Japanese) by T. Yamamoto, SAIENSU-SHA

【Textbook(supplemental)】

【Prerequisite(s)】Linear Algebra A, Linear Algebra B, Numerical Analysis

【】

【Web Sites】

【Additional Information】

20700

Applied Mathematics A3

工業数学 A3

【Code】20700 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】Fourier analysis originated in Fourier's work on thermal conduction and now becomes very important not only in mathematics but also in engineering, including applications in measurement technology. This course provides its theories and applications along with Laplace analysis closely related to it.

【Grading】Evaluation depends mainly on marks of examination, but marks of exercises and homework are taken into account when needed.

【Course Goals】To understand the fundamental theories of Fourier and Laplace analysis and develop an ability to apply them to concrete problems.

【Course Topics】

Theme	Class number of times	Description
Fourier series	2-3	The definition of Fourier series expansions are given and their fundamental properties such as computation of Fourier coefficients and convergence of Fourier series are discussed.
Properties and applications of Fourier series	3-4	Several properties of Fourier series and their applications to differential and difference equations and signal processing are discussed.
One-dimensional Fourier transform	3-4	The definition of one-dimensional Fourier transforms is given, and their fundamental properties such as the inversion formula and applications to partial differential equations are discussed.
Multi-dimensional Fourier transform	2-3	The definition of multi-dimensional Fourier transforms is given, and their fundamental properties and applications to partial differential equations are discussed.
Laplace transforms	2-3	Properties of Laplace transforms and their applications to differential equations are discussed.
Summary and learning achievement evaluation	1	A summary and supplements of this course are given and the learning achievement of students is evaluated.

【Textbook】S. Nakamura: Fourier analysis, Asakura shoten

【Textbook(supplemental)】H.Fukawa: Mathematics of control and vibration, KORONA-SHA

【Prerequisite(s)】Calculus, Linear Algebra and Differential Eqautions

【】

【Web Sites】

【Additional Information】

20550

Applied Mathematics for Engineering F1

工業数学Ｆ１

【Code】20550 【Course Year】2nd year 【Term】 【Class day & Period】Tue 3rd
【Location】313 (Nishikawa), 315 (Murakami) 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture
【Language】Japanese 【Instructor】Nishikawa (20550), Murakami (20551),
【Course Description】Introduction to complex analysis and some applications
【Grading】Regular examination and Reports
【Course Goals】Understanding the basics of complex analysis and obtaining ability to practice it
【Course Topics】

Theme	Class number of times	Description
Definition of complex and complex plane	1	
Differential of complex functions and Cauchy-Riemann relation	2	
Concept of regular functions	1	
Concept of conformal mapping	1	
Line integral of complex functions	1	
Cauchy's theorem and integral formula	2	
Taylor and Laurent series	1	
Singular points and residue theorem	2	
Application to definite integral	2	
Analytic continuation and expression of functions	1	
Confirmation of learning achievement	1	

【Textbook】To be referred to during the course (Nishikawa), Not used (Murakami)
【Textbook(supplemental)】To be referred to during the course
【Prerequisite(s)】Fundamentals of differential and integral calculus
【】
【Web Sites】
【Additional Information】

20650

Applied Mathematics for Engineering F2

工業数学Ｆ２

【Code】20650 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Kano, Otsuka,

【Course Description】Fourier analysis and its application will be described. The major part consists of Fourier series, Fourier transform, and Laplace transform.

【Grading】The regular examination, assignments, and attitude in the class will be taken into account.

【Course Goals】The goal is to understand the basics and applications of Fourier analysis.

【Course Topics】

Theme	Class number of times	Description
Preliminaries	1	The goal and outline of this class are presented. Then, basic knowledge necessary to learn Fourier analysis is briefly reviewed.
Fourier series	1	Fourier series expansion of periodic functions is described.
Complex Fourier series	1	Complex Fourier series, its differential and integral, and spectrum are described.
Characteristics of Fourier series	1	Characteristics of Fourier series are described.
Fourier transform	1	In order to cope with aperiodic functions, Fourier transform is described. Characteristics and applications of Fourier transform is explained together with the Parseval's equation and its applications.
Linear systems	1	Linear systems is described. Solutions of linear differential equations are given by using Fourier series expansion. In addition, impulse responses and transfer functions of linear systems are explained.
Summary of the first half	1	A summary of Fourier series and Fourier transform is provided, and an examination will be given.
Parseval's equality and its applications	1	Parseval's equality, the Wiener − Khinchin theorem, and the relationship between impulse responses and cross-correlation functions in linear systems are described.
Introduction to partial differential equations	1	Basic notions of partial differential equations are described.
Solutions of the wave equation and their physical interpretations	1	The wave equation, one of important partial differential equations, is solved and physical interpretations of its solutions are discussed.
Fourier series for solving the wave equation	1	Another expressions of solutions to the wave equation are derived in the form of Fourier series expansions.
Introduction to Laplace transform	1	Laplace transform and its characteristics are described aiming at solving ordinary differential equations.
Laplace transform for solving ordinary differential equations	1	Ordinary differential equations are solved by applying Laplace transform and its inverse transform.
Discrete Fourier transform and fast Fourier transform	1	Discrete Fourier transform for analyzing sampled data is described.
Evaluation of achievement	1	The achievements are evaluated.

【Textbook】Shinichi Ohishi: Fourier Analysis, Iwanami-Shoten

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

20651

Applied Mathematics for Engineering F2

工業数学Ｆ２

【Code】20651 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

20652

Applied Mathematics for Engineering F2

工業数学Ｆ２

【Code】20652 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】Fourier analysis, Laplace transform, Linear Algebra and their applications.

【Grading】The grading is made based on the regular examination.

【Course Goals】The final goal of this course is to understand basics of Fourier series expansion, Fourier transform, Laplace transform and Linear Algebra, and to learn to make full use of these mathematical tools in analyzing various physical phenomena and solving relevant differential equations. Particular emphasis is placed not on pursuing mathematical rigor but on developing skills to perceive different physical aspects of these tools and select the most appropriate one in practical problem solving.

【Course Topics】

Theme	Class number of times	Description
Fourier analysis, Laplace transform, Linear Algebra and their applications	15	Complex numbers and complex analysis (1-2 weeks) -complex numbers and complex functions -complex integrals, residue theorem, and their applications Delta function (1 week) Fourier series expansion (2-3 weeks) -periodic functions and their Fourier series expansion -complex Fourier series expansion -applications of Fourier series Fourier transform (2-3 weeks) -basics of Fourier transform -convolution and correlation function -applications of Fourier transform -linear response system Laplace transform and its applications (2 weeks) -basics of Laplace transform -applications of Laplace transform to linear systems Linear Algebra (3-4 weeks) - Vector space - Map and matrix Applications of Fourier transform and Laplace transform (1-2 weeks)

【Textbook】Lecture notes are distributed at the class.

【Textbook(supplemental)】

【Prerequisite(s)】Prerequisite subjects: complex numbers and basic calculus.

【】

【Web Sites】

【Additional Information】

20653

Applied Mathematics for Engineering F2

工業数学Ｆ２

【Code】20653 【Course Year】3rd year 【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
	9	
	2	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

20750

Applied Mathematics for Engineering F3

工業数学Ｆ３

【Code】20750 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Yasuhiro Inoue Associate Professor Institute for Frontier Medical Sciences

【Course Description】Introduction to special functions and mathematical methods for the physical sciences.

【Grading】The course grade will be based on homework(30%) and quizzes(70%).

【Course Goals】Understanding special functions and mathematical methods for the physical sciences, and developing problem solving skills.

【Course Topics】

Theme	Class number of times	Description
Orthogonal function	2	
Orthogonal polynominals	2	
Confluent hypergeometric function	1	
Gamma and Beta functions	2	
Bessel function	2	
Generalized function	2	
Green's function	1	
Partial differential equations for physical sciences	2	
Short Exam and Discussion	1	

【Textbook】

【Textbook(supplemental)】Mathematical Methods for Physicists, George B. Arfken and Hans J. Weber (Academic Press)

【Prerequisite(s)】Theories of complex function and differential equation

【】

【Web Sites】

【Additional Information】

Engineering Mechanics A

工業力学 A

【Code】20800 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Nishihara, Hanazaki,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

20802

Engineering Mechanics A

工業力学 A

【Code】20802 【Course Year】3rd year 【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	
	3	
	2	
	2	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50490

Flight Dynamics of Aerospace Vehicle

航空宇宙機力学

【Code】50490 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Kei Senda, Shinya Aoi

【Course Description】Flight dynamics of aerospace vehicles.

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

【Course Goals】To understand analytical mechanics through flight dynamics of aerospace vehicles.

【Course Topics】

Theme	Class number of times	Description
Analytical mechanics	7	introduction, coordinates, principle of virtual work, d'Alembert's principle, potential, Lagrange equation of motion, conservation law, Lagrange multiplier, Euler-Lagrange equation
Rigid body kinematics	3	Euler angles, angular rate, pseudo coordinates
Rigid body dynamics	3	kineteic energy of rigid body, linear and angular momentum, inertia tensor, Euler equation of motion
Dynamics of space vehicle	2	topics of attitude dynamics of space vehicles
Achievement confirmation	1	achievement confirmation to check up level of understanding

【Textbook】

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

Herbert Goldstein: Classical Mechanics, international ed
Toda and Nakajima: Introductory course of physics #1, #2, #10, etc. (Iwanami Shoten)

【Prerequisite(s)】Foundation of mechanics and mathematics

【】

【Web Sites】

【Additional Information】

51450

Engineering Exercise in Aeronautics and Astronautics

航空宇宙工学演義

【Code】51450 【Course Year】4th year 【Term】【Class day & Period】【Location】【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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50660

Engineering Laboratory in Aeronautics and Astronautics 1

航空宇宙工学実験 1

【Code】50660 【Course Year】3rd year 【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
	1	
	4	
	4	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50670

Engineering Laboratory in Aeronautics and Astronautics 2

航空宇宙工学実験 2

【Code】50670 【Course Year】3rd year 【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
	1	
	4	
	4	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51290

Structural Properties of Materials

構造物性学

【Code】51290 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】N. Tsuji, Y. Nose

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2-3	
	4-5	
	3-4	
	3-4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

52000

Introduction to Polymer Materials

高分子材料概論

【Code】52000 【Course Year】3rd year 【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	
	3	
	4	
	4	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51210

Electronic structure of solids and band theory

固体電子論

【Code】51210 【Course Year】3rd year 【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
Band Theory for Solids	4	
Fermi surface of metals	3	
Electronic structure of semiconductors	4	
Electronic structure of surfaces and interfaces	3	
Recent topics in solid state physics and surface science	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50710

Physics of Solids

固体物性学

【Code】50710 【Course Year】4th year 【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
Crystal structure	1	
Diffraction of waves by crystals	3~4	
Vibrations of crystals	3~4	
Thermal properties of crystals	2	
Electronic dtructures of crystals	3~4	
Assessment of achievement	1	

【Textbook】

【Textbook(supplemental)】"Introduction to solid state physics" by Charles Kittel , international ed.

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51470

Condensed Matter Physics

固体物性論

【Code】51470 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】H. Nakamura and Y. Tabata

【Course Description】Basic concept of optical, magnetic and superconducting properties of matters.

【Grading】

【Course Goals】Understanding of basic concept of optical, magnetic and superconducting properties of matters.

【Course Topics】

Theme	Class number of times	Description
Review of electromagnetism	2	Maxwell's equations and electromagnetic wave, vector potential, Hamiltonian for charged particle in electromagnetic field, etc.
Optical properties of matter	3	optical constants, electromagnetic wave in solid, Lorentz model, Drude model, band structure and optical response, Kramers-Kronig relation, etc.
Magnetism	6	magnetic moment, atomic magnetism, single-ion magnetism, paramagnetism, ferromagnetism, antiferromagnetism, molecular field, metallic magnetism, magnetic anisotropy, magnetization process, etc.
Superconductivity	3	Meisner effect, type-1 and type-2 superconductivity, London equation, flux quantization, origin of superconductivity, Josephson effect, SQUID, etc.
Assessment	1	Assessment

【Textbook】None

【Textbook(supplemental)】S. Blundel, Magnetism in Condensed Matter (Oxford Master Series in Physics) Oxford University Press

C. Kittel, Introduction to Solid State Physics, Wiley

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50120

Solid State Physics

固体物理学

【Code】50120 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】H. Nakamura

【Course Description】Introduction to microscopic solid state physics

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Crystal and lattice. Diffraction by crystal, Bonding energy of crystal	2	Lattice and crystal structure, Miller indices, Bragg's law, vanishing rule and structure factor, repulsion and attraction between atoms, various atomic bonding
Phonon	2	Sound wave in elastic body, dispersion relation, Brillouin zone, acoustic mode and optical mode, phonon
Introduction to statistical mechanics, Specific heat of solid	3	Introduction to statistical mechanics, Boltzman distribution, entropy, state sum and free energy, Einstein model for specific heat of solid, Debye model for specific heat of solid, thermal expansion of solid
Introduction to quantum mechanics	3	Introduction to quantum mechanics, Shrodinger equation, free electron/harmonic oscillator/hydrogen atom, physical quantities and operators
Free electron model. Thermal and transport properties of metal	3	Density of states, Fermi-Dirac distribution, electron specific heat, resistivity of metals, Hall effect, thermal conductivity of metals
Electrons in periodic potential	1	Effects of periodic potential, energy bands, metal/semiconductor/insulator
Assessment	1	Assessment

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

Mechanics of Solids

固体力学

【Code】50510 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】S. Biwa, Prof., Graduate School of Engineering

【Course Description】While the methods of stress-strain analysis for elementary structural members are the main topics in "Mechanics of Materials" courses, more general physical laws of the mechanical behavior of solids are dealt with in this course. Namely, fundamental principles of solid mechanics such as three-dimensional expressions of stress and strain, equilibrium equations, constitutive equations (Hooke's law) are treated together with mathematical analysis of static deformations in elastic bodies. These subjects are important for the understanding of basic principles of large-scale computational analysis of various mechanical/structural systems.

【Grading】Grading is made based on the examination, possibly with considerations of reports.

【Course Goals】This course aims to establish the understanding of rigorous expressions of stress and strain and fundamentals of deformation analysis of solids and structures. It is also the aim of this course to re-examine the value of approximate theories given in "Mechanics of Materials" courses from a rigorous viewpoint.

【Course Topics】

Theme	Class number of times	Description
Preliminaries	1	Components of vectors and stresses; Basis vecotrs; Kronecker's delta; Alternating symbol; Summation convention
Deformation and strain	2	Description of motion; Material time derivative; Green-Lagrange strain; Infinitesimal strain; ransformation of strain components; Principal strains
Stress	2	Stress vector, Euler's laws of motion; stress tensor components; Cauchy's relation; Transformation of stress components; Cauchy's laws of motion; Equilibrium equations; Symmetry of stress; Principal stresses and stress invariants
Stress-strain relations	1	Hooke's law; Elastic moduli; Voigt expression
Fundamental equations of elasticity	2	Navier's equations; Plane stress and plane strain; Compatibility relation for strain
Two-dimensional problems of elastic deformations	3	Airy's stress function; Biharmonic equation; Stress function in polar coordinates; Two-dimensional elastostatic problems; Stress concentration around a circular hole
Applications of elasticity	2	Anisotropic elasticity; In-plane elastic property of laminated plates
Principle of virtual work	2	Virtual displacement; Principle of virtual work; Principle of stationary potential energy

【Textbook】Textbooks are not assigned. The lecture is given in a "blackboard" style.

【Textbook(supplemental)】T. Inoue, "Fundamentals of elasticity" (Nikkan Kogyo)

S. Kobayashi and K. Kondo, "Elasticity" (Baihu-kan) ;

For references written in English, students are advised to contact the instructor directly.

【Prerequisite(s)】The enrolling students are expected to have knowledge in "Mechanics of Materials" courses. Good understanding of calculus, linear algebra (eigenvalue problems) and vector analysis is preferable.

【】Homeworks (reports) will be assigned to review the lectures.

【Web Sites】

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

51350

Fundamentals of Materials Science I

材料科学基礎 1

【Code】51350 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】A end-term examination will be a main part of grading determination. Attendance and daily reports may be considered in grading determination.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Structure of solids	1	
Lattice defects	1	
Diffusion in solids	5	
Deformation of crystalline materials	2	
Plastic deformation of single crystals of metallic materials	2	
Plastic deformation of polycrystalline metals	2	
Deformation twinning and creep deformation	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】A part of themes will be added or omitted depending on a number of classes in the term.

51360

Fundamentals of Materials Science II

材料科学基礎２

【Code】51360 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】This lecture focuses on symmetry, tensor and elastodynamics that are of importance for materials science.

【Grading】Grading is due to the term-end examination. The record of attendance may be taken into account.

【Course Goals】To understand the role of symmetry, tensor and elastodynamics on materials science.

【Course Topics】

Theme	Class number of times	Description
Vector and tensor	4-5	Fundamentals of vector and tensor
Symmetry in molecules and crystals	4-5	Fundamentals of symmetry in molecules and crystals
Elastodynamics	4-5	Fundamentals of elastodynamics

【Textbook】Handouts will be given in lectures.

【Textbook(supplemental)】

【Prerequisite(s)】Fundamentals of thermodynamics

【】

【Web Sites】

【Additional Information】

51722

Fundamentals of Materials Science III

材料科学基礎３

【Code】51722 【Course Year】 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】Students entering in FY 2015 should take "Fundamentals of Microstructure of Materials 1" in the first term

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

D.A.Porter and K.E.Easterling: Phase Transformations in Metals and Alloys

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50620

Materials Science Laboratory and Exercise 1

材料科学実験および演習 1

【Code】50620 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】3

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	6	
	6	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50630

Materials Science Laboratory and Exercise 2

材料科学実験および演習２

【Code】50630 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】3

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	6	
	6	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50080

Fundamentals of Materials 1

材料基礎学 1

【Code】50080 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Naohide TOMITA,

【Course Description】Introductory class to teach fundamentals for Material Science.

【Grading】reports and a test

【Course Goals】

【Course Topics】

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

【Textbook】isbn:4901381008 be sold at 日本材料学会事務所（http://www.jsms.jp/index.html)

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50082

Fundamentals of Materials 1

材料基礎学 1

【Code】50082 【Course Year】2nd year 【Term】 【Class day & Period】

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

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

【Course Description】Introduction to materials science and metallurgy for beginners

【Grading】Regular examination of paper test

【Course Goals】Learning of basic knowledge of materials science

【Course Topics】

Theme	Class number of times	Description
Structure of Materials	3	electron configuration, bonding and structure in crystalline materials, density and thermal expansion
Phase Equilibrium	3	phase equilibrium diagram, solid solution, solidification, eutectic and eutectoid transformation
Mechanical Propterties	2	elastic and plastic deformation, stress-strain curve, fractography, creep, ductile-brittle transition
Heat Treatment	2	quenching and tempering, martensitic transformation, annealing, normalizing, diffusion, continuous cooling transformation diagram
Functional Properties	3	thermal conductivity, specific heat, electrical conductivity, electron conduction, absorption and reflection of light
Resource and Recycle	1	crustal abundance, recoverable reserves, urban mines, recycling rate, life cycle assessment
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51540

Fundamentals of Materials 2

材料基礎学 2

【Code】51540 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Okumura,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】Text book can be bought at the society of material science, Japan at Hyakumanben near Kyoto university. http://www.jsms.jp/

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51610

材料強度学

【Code】51610 【Course Year】4th year 【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	
	3	
	1 ～ 2	
	1 ～ 2	
	1 ～ 2	
	1 ～ 2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50700

Physics of Strength of Materials

材料強度物性

【Code】50700 【Course Year】3rd year 【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	
	3	
	1	
	7	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51730

Fundamentals of Microstructure of Materials

材料組織学

【Code】51730 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】Crystal growth and solidification of metallic alloys Development of microstructure, on the basis of thermodynamics and kinetics

【Grading】Score will be evaluated by routine test. Others (reports etc) may be used for evaluation.

【Course Goals】To know and understand relationship between microstructure evolution and thermodynamics / kinetics.

【Course Topics】

Theme	Class number of times	Description
Basic concept	1	Thermodynamics, Kinetics (required for understanding this class)
Nucleation, Curvature effect	1	Curvature effect, clasical nucleation theory
Interface morphology	1	Interface morphology (atomic scale), macroscopic interface shape
Growing interface	2-3	Solute partition at the interface, stability of interface
Dendritic growth	1-2	Dendrite growth, (mechanism and microstructure evolution)
Solute partition, segregation	1	Solute partition and atomic diffusion around growing interface, segregation
Eutectic growth	1	Mechanism of eutectic growth, microstructure evolution
Non-equilibrium solidification	1	Metastable phase, non-equilibrium phase (i.e. amorphous / metallic glass)
Microstructure and phase diagram	3	Relationship between microstructure and phase diagram, phase election
Sammury	1	Summary of this class

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Fundamentals of Microstructure of Materials 1,2 and 3

【】

【Web Sites】

【Additional Information】Details may be modified

51020

Electrochemistry for Materials Processing

材料電気化学

【Code】51020 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Kuniaki MURASE, Kazuhiro FUKAMI

【Course Description】This course serves the fundamentals related to solution chemistry of electrolytes and electrode reactions, which become the basis of wet processing such as electrolytic refining, electrowinning, corrosion, anticorrosion, and functional electrodeposition.

【Grading】(1) Class participation, (2) take-home assignments, and (3) exams. Students will sign a roll sheet every class. Supplementary examination to bail out low-performing students will not be given for any reason.

【Course Goals】In this course students learn basic technical terms and basic concepts of physical chemistry, which are necessary to study materials science and engineering from the viewpoints of solution chemistry and electrochemistry, to take subsequent advanced courses on materials science and engineering.

【Course Topics】

Theme	Class number of times	Description
Solution chemistry of electrolytes	4	Acid-base and redox reactions; The difference between them.
Introduction of electrode potential	3	Electrode surface; Electrode potential; Nernst's equation.
Electrode reactions	3	Kinetics of electrode reactions; Fundamentals of Electrochemical apparatus, batteies and corrosion
Polarization curves	2	Current density vs. potential curves; Polarization curves; Overpotential; Polarizable and non-polarizable interfaces; Diffusion-limitations.
Transfer of ions	2	Ion transfer in aqueous electrolytes; Diffusion potential and liquid junction potential.
Self-assessment of achievement	1	Review of the course contents.

【Textbook】A course booklet will be given out at the first lecture.

【Textbook(supplemental)】

【Prerequisite(s)】Knowledge given in Thermodynamics of Materials 2 (by Prof. Uda) is preferable.

【】

【Web Sites】

【Additional Information】

51340

Statistical Physics of Materials

材料統計物理学

【Code】51340 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Yoshikazu Tabata , Koretaka Yuge

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
First and second law of thermodynamics, Irreversible process	2	
Thermodynamic functions, Phase Equilibrium and Phase Transition	2	
Analytical mechanics and concept of statistical mechanics	3	
Basic of classical statistical thermodynamics	2	
	3	
Quantum statistical thermodynamics	3	
Check of acquisition	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51630

Thermodynamics of Materials 1

材料熱力学１

【Code】51630 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Hiroyuki Sugimura,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51640

Thermodynamics of Materials 2

材料熱力学２

【Code】51640 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Tetsuya Uda,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Fundamental of thermodynamics	4	Internal energy,enthalpy,heat capacity Entropy and second law Direction of system change
Chemical potential	3	Extensive and intensive variable,chemical potential Composition-dG diagram and chemical potential Phase rule,phase equilibria Ideal solution,Henrian standard state, activity
Phase diagrams	1	Relationship between phase diagram and Gibbs energy Invariant reaction in binary systems
Thermodynamcis for electrode and ion	2	Electrode potential, electromotive force Standard state for ion, Standard hydrogen electrode
Chemical potential diagrams	3	Chemical potential diagrams for ternary systems Electrode potential-pH diagram

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50360

Physical Chemistry of Materials

材料物理化学

【Code】50360 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Ikuji Takagi, Takayuki Sasaki, Taishi Kobayashi

【Course Description】Lecture on phisicochemical processes concerning fission and fusion reactors, such as of isotope enrichment, non-stoichiometry of uranium dioxide, diffusion and permeation of tritium, neutron activation and irradiation effects.

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction	1	General statement of nuclear materials and fuel cycle processes.
Isotope enrichment	2	Isotope effect in kinetic theory of gas, typical examples of gaseous diffusion method and centrifugal separation method.
Nuclear fuels	2	Elementary chemical thermodynamics, production process of nuclear fuels, non-stoichiometry of uranium dioxide, burnup effect on oxygen potential
Fission reactor materials	2	General statement of fission reactor materials, irradiation damage, stress-corrosion cracking, degradation by oxidation and hydriding.
Fusion reactor materials	3	General statement of fusion reactor materials, neutron activation, effect of high-heat load, tritium breeding, inventory and leakage.
Irradiation effect	2	Irradiation effects on ductile-brittle transition temperature, tensile strength, density, electrical conductivity, thermal conductivity, optical property and semiconducting property.
Nuclear fuels	2	Behavior of nuclear fuel and fission products in the reactor are explained using oxygen partial pressure and state diagram.
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50361

Physical Chemistry of Materials

材料物理化学

【Code】50361 【Course Year】3rd year 【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	
	6	
	3	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51220

Fundamentals of Materials Processing

材料プロセス工学

【Code】51220 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Hiroyuki Sugimura,Akira Sakai,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51200

Analytical Sciences

材料分析化学

【Code】51200 【Course Year】3rd year 【Term】2nd term 【Class day & Period】Wed 2nd
【Location】Engineering Science Depts Bldg.-101 【Credits】2 【Restriction】No Restriction
【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Jun Kawai, Koretaka Yuge
【Course Description】Quantum spectrochemistry, which is a basis of spectrochemical analysis, will be lectured. Various kinds of spectrometries which are used in materials analysis will also be explained.
【Grading】Checked only by exam.
【Course Goals】The goal of the course is to obtain knowledges about quantum chemistry, interaction between photons and electrons, spin, principles of spectrometers, quantum mechanical calculations related to spectroscopy, and so forth, which are necessary for spectrochemical analysis.
【Course Topics】

Theme	Class number of times	Description
1. Quantization	1	Bragg diffraction equation deduced from Bohr-Sommerferd quantization. Compton scattering equation explained from both wave and particle views.
2. Principle of least action	2	Refraction of electron beam. Phase velocity and group velocity. Spin and helicity of photon. Polarization of light. Inertial mass and gravitational mass of photon and its relation to Maessbauer spectroscopy. Zeeman effect.
3. Matrix mechanics	1	Scheroedinger equation. Matrix mechanics. Role of harmonic oscillator in atomic spectra.
4. Perturbation theory	2	Time independent perturbation theory applied to ionic crystal.
5. Optical transition	2	Blackbody radiation. Time dependent perturbation. Tsallis entropy. Electric dipole transition.
6. Harmonic oscillator	1	Harmonic oscillator. WKB approximation. Field quantization.
7. Electron spectroscopy	1	Photoelectron spectroscopy of transition metal compounds. Configuration interaction.
8. Symmetry	1	Symmetry of molecules. Group theory. Projection operator.
9. Interaction between electrons and photons	2	IR and Smekal-Raman spectroscopy.
10. Angular momentum and spin	1	Angular momentum and spin. Spin-orbital interaction.
11. Check of achievement	1	

【Textbook】J. Kawai, "Quantum Spectrochemistry", 2nd Edition, AGNE Gijutsu Center, Tokyo (2015).(ISBN:9784901496759)
【Textbook(supplemental)】
【Prerequisite(s)】
【】
【Web Sites】http://www.process.mtl.kyoto-u.ac.jp/
【Additional Information】

50040

Mechanics of Materials 1

材料力学 1

【Code】50040 【Course Year】2nd year 【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
	1	
	1	
	2	
	1	
	4	
	1	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50041

Mechanics of Materials 1

材料力学１

【Code】50041 【Course Year】2nd year 【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
	1	
	1	
	2	
	1	
	4	
	1	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50042

Mechanics of Materials 1

材料力学１

【Code】50042 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Imatani(50042), Hoshide(50043),

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Concepts of Mechanics of Materials	2	
Subjects on Simple Stress States	3	
Strain Energy	2	
Bending of Beams	5	
Complex beams	2	
	1	

【Textbook】ISBN:4-563-03465-7

(Zairyo Rikigaku no Kiso, Shibata, Ohtani, Komai, Inoue, Baifukan)

【Textbook(supplemental)】

【Prerequisite(s)】Fundamentals of Mathematics and Physics

【】

【Web Sites】

【Additional Information】

50043

Mechanics of Materials 1

材料力学１

【Code】50043 【Course Year】2nd year 【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
	2	
	3	
	2	
	5	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50050

Mechanics of Materials 2

材料力学２

【Code】50050 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】M. Nishikawa (50050), Hayashi (50051),

【Course Description】The simplified one-dimensional treatments lectured in Mechanics of Materials 1 are extended to include more complex two- or three-dimensional problems. Analytical methods for the deformation and the stresses in various structural members are lectured including the combined stress states.

【Grading】Grading is based on the mid-term and the final examinations, possibly with considerations of class-room tests or reports.

【Course Goals】The emphasis is to understand the fundamental concepts and methods for the stress/strain analysis of various structures or struictural members, by advancing the basic principles given in Mechanics of Materials 1.

【Course Topics】

Theme	Class number of times	Description
Beam bending	2	Beam bending; Castigliano's theorem
Advanced problems of beams	3	Statically indeterminate beams; continuous beams; curved beams
Basics of elasticity	4	Combined stress states; Mohr's stress and strain circles; equilibrium equations; displacement-strain relations; stress-strain relations; plane stress or strain states; relation between elastic constants
Torsion	2	Torsion of circular bars; coil springs; Combination of bending and torsion
Axially symmetric problems	1	Buckling of column; instability; effect of support conditions; buckling design
Axially symmetric problems and bending of plates	2	Circular cylinders; spherical shells; rotating circular plates; Cylindrical bending, bending rigidity;
Assessment	1	Academic achievement assessment

【Textbook】Fundamentals of Strength of Materials (Zairyo-Rikigaku no Kiso) (T. Shibata et al.), Baifu-kan .

【Textbook(supplemental)】

【Prerequisite(s)】Mechanics of Materials 1, and other subjects such as calculus, linear algebra, mechanics of particles and rigid bodies.

【】

【Web Sites】

【Additional Information】The order and the hours (weights) for each item are possibly subject to change.

50051

Mechanics of Materials 2

材料力学２

【Code】50051 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】The simplified one-dimensional treatments lectured in Mechanics of Materials 1 are extended to include more complex two- or three-dimensional problems. Analytical methods for the deformation and the stresses in various structural members are lectured including the combined stress states.

【Grading】Grading is based on the mid-term and the final examinations, possibly with considerations of class-room tests or reports.

【Course Goals】The emphasis is to understand the fundamental concepts and methods for the stress/strain analysis of various structures or struictural members, by advancing the basic principles given in Mechanics of Materials 1.

【Course Topics】

Theme	Class number of times	Description
Beam bending	2	Beam bending; Castigliano's theorem
Advanced problems of beams	3	Statically indeterminate beams; continuous beams; curved beams
Basics of elasticity	4	Combined stress states; Mohr's stress and strain circles; equilibrium equations; displacement-strain relations; stress-strain relations; plane stress or strain states; relation between elastic constants
Torsion	2	Torsion of circular bars; coil springs; Combination of bending and torsion
Axially symmetric problems	1	Buckling of column; instability; effect of support conditions; buckling design
Axially symmetric problems and bending of plates	2	Circular cylinders; spherical shells; rotating circular plates; Cylindrical bending, bending rigidity;
Assessment	1	Academic achievement assessment

【Textbook】Fundamentals of Strength of Materials (Zairyo-Rikigaku no Kiso) (T. Shibata et al.), Baifu-kan .

【Textbook(supplemental)】

【Prerequisite(s)】Mechanics of Materials 1, and other subjects such as calculus, linear algebra, mechanics of particles and rigid bodies.

【】

【Web Sites】

【Additional Information】The order and the hours (weights) for each item are possibly subject to change.

50052

Mechanics of Materials 2

材料力学２

【Code】50052 【Course Year】2nd year 【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
	3	
	2	
	4	
	4	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51281

Systems Engineering

システム工学

【Code】51281 【Course Year】3rd year 【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	
	4 〜 5	
	1 〜 2	
	1 〜 2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50240

Vibration Engineering

振動工学

【Code】50240 【Course Year】3rd year 【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
	3	
	3	
	1	
	4	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50241

Vibration Engineering

振動工学

【Code】50241 【Course Year】2nd year 【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	
	2	
	2	
	3	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50480

Fundamentals of Aerospace Propulsion

推進基礎論

【Code】50480 【Course Year】3rd year 【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
Propulsion Fundamentals	1	
	3	
Ionized Gases	1	
Electromagnetics	2	
Equation of Ionized Gases	1	
Atomic and Molecular Collisions	2	
Diffusion and Transport of Ionized Gases	1	
Ionized Gases near Solid Surfaces	2	
Electric Propulsion	1	
	1	

【Textbook】

【Textbook(supplemental)】R.W. Humble, G.N. Henry, and W.J. Larson, Space Propulsion Analysis and Design (McGraw-Hill, New York, 1995)

G.P. Sutton and O. Biblarz, Rocket Propulsion Elements, 8th ed. (John Wiley & Sons, Hoboken, 2010) ;

G.P. Sutton and O. Biblarz, Rocket Propulsion Elements, 7th ed. (Wiley, New York, 2001) ;

M. Mitchner and Ch.H. Kruger, Jr., Partially Ionized Gases (Wiley, New York, 1973) ;

F.F. Chen, Introduction to Plasma Physics and Controlled Fusion, 3rd ed. (Springer International Publishing Switzerland, Cham, 2016) ;

F.F. Chen, Introduction to Plasma Physics and Controlled Fusion, Vol. 1, Plasma Physics, 2nd ed. (Plenum, New York, 1984) ;

L.M. Biberman, V.S. Vorobev, and I.T. Yakubov, Kinetics of Nonequilibrium Low-Temperature Plasmas (Consultants Bureau, New York, 1987);

R.O. Dendy ed., Plasma Physics: An Introductory Course (Cambridge University Press, London, 1993) , (同 , 1995) ;

M.A. Lieberman and A.J. Lichtenberg, Principles of Plasma Discharges and Materials Processing (Wiley-Interscience, Hoboken, 2005) .

【Prerequisite(s)】Fluid Dynamics, Gas Dynamics, Thermodynamics, Electromagnetics

【】

【Web Sites】

【Additional Information】

90252

Numerical Analysis

数値解析

【Code】90252 【Course Year】3rd year 【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	
	6	
	3	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

91180

Analysis in Mathematical Sciences

数理解析

【Code】91180 【Course Year】4th year 【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	
	5	
	3	
	2	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50250

Control Engineering 1

制御工学 1

【Code】50250 【Course Year】 【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	
	3	
	2	
	2-3	
	3	
	2-3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50251

Control Engineering 1

制御工学 1

【Code】50251 【Course Year】 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】Control Engineering provides a methodology of controlling various systems including mechanical ones in a systematic way. Its major part consists of both Classical Control Theory and Modern Control Theory. This class describes the fundamentals of Classical Control Theory.

【Grading】Scores of quizzes, reports and the regular examination are taken into account.

【Course Goals】The course goal is to understand the basic concepts of Classical Control Theory such as transfer functions, frequency responses and stability.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	The basic idea of Control Engineering such as the purpose and methods of control is described through various real world examples.
Representation of dynamical systems	2-3	Mathematical description of systems is developed first. Then, the concept of Transfer Functions is introduced based on Laplace Transform, and Block diagram representation is shown.
Responses of dynamical systems	3	Time responses of linear systems are shown. Stability of systems and Stability tests are described.
Properties of feedback systems	2-3	Basic properties such as steady state characteristics of feedback control systems and Root Locus are explained.
Frequency responses	3-4	The concept of Frequency responses, Bode diagrams, Vector locus are introduced. The stability test of feedback systems based on the frequency responses is explained.
Design of control systems	2	Basic components of classical controller design methods such as Phase lead, Phase Lag, and PID compensation are described.

【Textbook】T. Sugie, M. Fujita: Introduction of Feedback Control. Corona Publishing Co. Ltd.

【Textbook(supplemental)】T. Sugie, H. Kajiwara: Exercises in System Control Engineering. Corona Publishing Co. Ltd.

【Prerequisite(s)】Elementary knowledge of Laplace Transform is required.

【】

【Web Sites】none

【Additional Information】Some parts of the above contents may be skipped/added depending on the course schedule of the year.

50252

Control Engineering 1

制御工学 1

【Code】50252 【Course Year】3rd year 【Term】 【Class day & Period】

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

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Ichiro Maruta,

【Course Description】Control engineering consists of theory and methodology to design control systems. It includes the classical control theory to design feedback control systems based on transfer functions and frequency response.

【Grading】The evaluation is based on repots (40%) and exam (60%).

【Course Goals】The goal of this course is to understand the classical control theory and the related methodologies to design feedback control systems based on transfer functions and frequency response.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	History and background of control engineering
Dynamical systems and transfer functions	4	Basic knowledge on dynamical systems, ordinary differential equations, transfer functions and block diagrams
Transit response and stability	3	Stability of dynamical systems, transit response, steady response and Routh-Hurwitz stability criteria
Frequency response	2	Basic knowledge on frequency response using Bode plots and vector locus
Characteristic of feedback control systems	3	Performance criteria of feedback control systems using Nyquist's stability criteria and the root locus method.
Design of feedback control system	2	How to design feedback control system using phase-lead compensation, phase-lead-lag compensation and PID control

【Textbook】T. Sugie and M. Fujita: Introduction to feedback control (in Japanese), Corona Publisher,

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50270

Control Engineering 2

制御工学 2

【Code】50270 【Course Year】3rd year 【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	
	2	
	1	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50300

Production Engineering

生産工学

【Code】50300 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】This course deals with how to construct and operate a manufacturing system of a mechanical product.

【Grading】The regular examination, in-class examinations and reports are taken into account.

【Course Goals】The goal is to understand the concept of a manufacturing system, and to become able to handle related basic decision-making problems.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	The overall concept of a manufacturing system is given.
Industrial Economics	2	After introducing the concept of the manufacturing cost and cash flow, how to make decisions using the concept (for example, the DCF method for investment decisions) is addressed.
Production & Operations Management	2	Demand forecasting, production planning, inventory management, MRP, JIT, etc. are covered.
	3	
Production Scheduling	2	Basic approaches for single machine scheduling, flow shop scheduling, job shop scheduling, and project scheduling are introduced.
Plant Layout & Line Blancing	2	Basic approaches for plant layout and line balancing are introduced.
Industrial Engineering	2	After introducing the principles of motion economy, the approaches for process analysis, human-machine analysis, Therblig analysis, standard time setting, etc. are addressed.
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】The topics covered may be modified from the plan according to the actual schedule.

50960

Production Engineering

生物物理学

【Code】50960 【Course Year】3rd year 【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	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50990

Precision Machining

精密加工学

【Code】50990 【Course Year】4th year 【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	
	3	
	3	
	2	
	2	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51550

Mechanical Design 1

設計工学 1

【Code】51550 【Course Year】3rd year 【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	
	4	
	3	
	3	
	2	
	2	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51560

Mechanical Design 2

設計工学 2

【Code】51560 【Course Year】3rd year 【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
	5	
	3	
	2	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51710

Intelligent Systems Engineering

知能システム工学

【Code】51710 【Course Year】4th year 【Term】 【Class day & Period】Wed 2nd

【Location】Engineering Science Depts Bldg.-314 【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	
	2-3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51410

Neutron Physics and Engineering

中性子理工学

【Code】51410 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Seiji Tasaki,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60630

Fundamentals of Circuit Theory

電気回路基礎論

【Code】60630 【Course Year】1st year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】The course introduces the fundamentals of the electric circuit. Topics covered include: resitive elemnts and networks; independent sources; switches and dynamics of first- and second-order networks; phasor analysis; 2-port circuits.

【Grading】Reports and examinations

【Course Goals】Students are expected to learn the transient analysis by differential equation and steady state analysis by phasor.

【Course Topics】

Theme	Class number of times	Description
DC circuit	3	We introduce Kirchhoff's current law and Kirchhoff's voltage law, Ohm's law and independent sources.
Differential equation of circuit	5	We introduce inductors and capacitors and explain the differential equation of circuit.
AC circuit	4	We introduce phasor and explain the steady state analysis.
two-port circuit	2	We extend one-port elements to two-port circuits.
academic achievement test	1	The level of understanding on this lecture will be confirmed.

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51530

Heat transfer

伝熱工学

【Code】51530 【Course Year】3rd year 【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	
	2-3	
	1-2	
	4	
	2	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50730

Statistical Thermodynamics

統計熱力学

【Code】50730 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Mitsuhiro Matsumoto,

【Course Description】Statistical mechanics provides a firm foundation for thermodynamics. I'll give a standard course of statistical mechanics through several basic examples in various fields of science and engineering, including quantum mechanics, solid state physics, heat transfer engineering, and information technology.

【Grading】- Written examination
- Paper assignment

【Course Goals】- Understanding the relation between macroscopic variables and microscopic states.
- Scientific view of various phenomena in science and engineering based on statistics.

【Course Topics】

Theme	Class number of times	Description
Concepts of statistica physics	2	- Thermodynamics vs. statistical mechanics - Review of basic statistics - Counting microscopic states
Ensembles and various types of free energy	4	- Microcanonical ensemble: Boltzmann's definition of entropy - Canonical ensemble: temperature, Boltzmann distribution, partition function, and free energy - Various statistical ensemble
Quantal vs. classical	4	- Introduction to many-body quantum mechanics - Fermi-Dirac distribution: free electron model - Bose-Einstein distribution: photons and phonons - Classical limit: ideal gas and real gas
Advanced topics	4	- Introduction to solid state physics: band theory and basic model of semiconductor devices - Intdoduction to information theory: Shannon's entropy, transinformation - Introduction to transport phenomena: kinetic theory of gases, mass and energy diffusion
Examination	1	

【Textbook】Lecture notes will be provided.

【Textbook(supplemental)】

【Prerequisite(s)】Basic knowledge of thermodynamics, calculus, statistics, analytical mechanics, and quantum physics will be useful.

【】

【Web Sites】http://www.mitsuhiromatsumoto.mech.kyoto-u.ac.jp/

【Additional Information】

50731

Statistical Thermodynamics

統計熱力学

【Code】50731 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Miyake, Horii,
【Course Description】In this lecture, fundamental ideas of Statistical Thermodynamics which is effective to microscopic understanding of macroscopic systems and some typical applications to condensed matter physics are presentaed.
【Grading】Situation of voluntary submission of some reports and score of exam are totally evaluated.
【Course Goals】The goals of this lecture are both to understand fundamental idead of Statistical Thermodynamics and to study typical applications to condensed matter physics.
【Course Topics】

Theme	Class number of times	Description
Outlines	1	Basic ideas of Statistical Thermodynamics, thermal equilibrium, fundamentals of Statistics, means of measuremnts, ergodic theory.
Themodynamic functions	1	Thermodynamic laws, thermodynamic functions, Legendre transform, Maxwell relations, Gibbs-Helmholtz equation, thermodynamic variation, phase equilibrium.
Ideal systems	4	Phase space of movement, Liouville's theorem, micro canonical ensemble,Partition function, relation between Helmholtz free energy and Partition function,Principle of Boltzmann, simple applications of microcanonical ensamble (ideal gas, elastic of gum)
	1	
Canonical ensemble	2	Distribution with the maximum probability, Partition function, the 3rd law of thermodynamics, Gibbs's paradox, grand canonical ensamble.
Quantum statistics	2	Grad canonical ensamble of quatum statistics, Fermion and Boson, Bose-Einstein statistics, Fermi-Dirac statistics,ideal Fermi gas, electron specific heat, ideal Bose gas, Bose-Einstein condensation.
Typical applications	4	Systems with two levels, Schottly type specific heat, Statistics of photons, Planck's equation, one dimansional harmonic oscillation, Einstein model and specific heat of solid states.
Evaluation od goals	1	Understanging of typical applications of statistic themodynamics and submission of homeworks.

【Textbook】The textbook is not appointed. Writing on the blackboard is performed in every lecture.
【Textbook(supplemental)】１．原島　鮮：「熱力学・統計力学」培風館,
２．N. スミス（小林宏・岩橋槇夫訳）：「統計熱力学入門－演習によるアプローチー」東京化学同人,
３．市村　浩：「統計力学」裳華房,
４．市村　浩：「熱学演習ー統計力学」裳華房,
５．キッテル：「熱物理学」丸善,
６．沼居貴陽：「熱物理学・統計物理学演習」丸善,
７・W. グライナー，L. ナイゼ，H. シュテッカー（伊藤伸泰，青木圭子訳）：「熱力学・統計力学」シュプリンガー,
８．久保亮五：「ゴム弾性」裳華房
【Prerequisite(s)】Students are roughly expected to have mastered basics of mathematics, dynamics, elementary quantum mechanics, thermodynamics and statistics.
【】
【Web Sites】
【Additional Information】2nd year students may undestand this lecture if they catch on basics of physics.

Statistical Mechanics

統計力学

【Code】51300 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Seiji Tasaki, Associate Professor

【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】

50370

Heat and Mass Transfer

熱及び物質移動

【Code】50370 【Course Year】3rd year 【Term】1st term 【Class day & Period】Mon 2nd

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

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

【Course Description】The fundamentals of transport phenomena for the engineers and/or researchers related to physical engineering are given.

【Grading】Assignment and written examination

【Course Goals】To be able to apply the fundamental equations of thermal and mass transport studied in the class to real phenomena.

【Course Topics】

Theme	Class number of times	Description
One dimensional heat conducion	2	Difference between heat and temperature. Similarity among heat, mass, and momentum transfers. Fourier's law, Steady heat conduction.
Non-steady heat transfer	2	Diffusion equation, solved by Fourier expansion, Laplace transform, and numerical method.
Conservation rules	1	Fourier's law, Steady heat conduction.
Molecular kinetics	1	Maxwell's theorr.
Heat conduction of cylinder and sphere	1	Heat transfer of cylindrical and sperical coordinates.
2 dimensional heat conduction	1	2 dimensional Laplace equation.
Green function	2	Green function. Relation between Schroedinger equation and diffusion equation.
Hydrodynamics	2	Navier Stokes equation.
Boundary layer	1	
Electromagnetic radiation	1	
Achievement check	1	Learning how to solve the problems through practical exercises.

【Textbook】河合著 :「物理工学・化学工学を学ぶための熱・物質移動の基礎」丸善 (2005)

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】(50370) http://www.process.mtl.kyoto-u.ac.jp/

【Additional Information】

50371

Heat and Mass Transfer

熱及び物質移動

【Code】50371 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】T. Sagawa/H. Okumura,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50460

Thermodynamics and Statistical Mechanics

熱統計力学

【Code】50460 【Course Year】3rd year 【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	
	4	
	3	
	2	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51620

Thermodynamics 1

熱力学１

【Code】51620 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51621

Thermodynamics 1

熱力学１

【Code】51621 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

Thermodynamics 1

熱力学１

【Code】51622 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】K. Ishihara,

【Course Description】Fundamentals of thermodynamics are given.

【Grading】Written examination

【Course Goals】To understand the idea of the first and second laws of thermodynamics and to calculate the state quantities at the changes in state.

【Course Topics】

Theme	Class number of times	Description
Introduction to thermodynamics	1	History of thermodynamics, introduction of variables and units using in thermodynamics
The first law of thermodynamics	3	Definition of heat, Quasi-static process, specific heat, enthalpy, ideal gas are shown.
The second law of thermodynamics	2	Reversible and irreversible process, Ideal cycle, Carnot cycle by ideal gas, introduction of entropy
Thermal engine	3	Free expansion/compression of gas, Otto cycle, Brayton cycle, Carnot cycle are explained.
Free energy	3	Free energy, Maxwell equations, Joule-Thompson's experiment
Phase transformation	2	Phase, first order phase transformation, metastable equilibrium, critical point, second order phase transportation
Achievement check	1	Leaning how to solve equations In the practical exercises.

【Textbook】

【Textbook(supplemental)】Thermodynamics and statistical mechanics (A. Harajima, Baifukan) (in Japanese).

【Prerequisite(s)】The fundamental calculas

【】

【Web Sites】

【Additional Information】

50070

Thermodynamics 2

熱力学２

【Code】50070 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50071

Thermodynamics 2

熱力学２

【Code】50071 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50072

Thermodynamics 2

熱力学２

【Code】50072 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Graduate School of Energy Science, Professor, Ishiyama

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50870

Quality Control

品質管理

【Code】50870 【Course Year】4th year 【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
Introduction	1	
Statistics and hypothesis testing	2	
Statistical process control	2	
Design of experiments	2	
Analysis of variance	2	
Application of design of experiments	2	
Reliability	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51330

Fundamentals of Materials Science

物質科学基礎

【Code】51330 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Kuniaki MURASE

【Course Description】Based primarily on the solid-state chemistry, this course serves the outline of notation (descriptive method) and analytical techniques for solid substances, which become the basis of materials science and materials engineering.

【Grading】(1) Class participation, (2) take-home assignments (approx. 50% in total), and (3) exams (approx. 50 %). Students will sign a roll sheet every class. Ten written take-home assignments are due throughout the semester. Supplementary examination to bail out low-performing students will not be given for any reason.

【Course Goals】Basic knowledges of physics, chemistry, mathematics, etc. are requires to learn materials science and materials engineering. In this course students learn basic technical terms and develop fundamental concepts of solid-state materials chemistry, to take subsequent advanced courses on materials science and materials engineering.

【Course Topics】

Theme	Class number of times	Description
Substances and materials	1	Three states of matter; Amorphous and glasses; Liquid crystal; Materials structures and properties in our surrounding living environment.
Fundamentals of crystal structures	3	Close packing and holes; Crystal structure of metals; Point symmetry and space symmetry; Lattice and unit structure; Crystal system and Bravais lattice; Depiction of lattice plane and lattice direction; Fractional coordinates.
Fundamentals of chemical bond theory	2	Electronic configuration and shielding; Size of atoms and ions; Covalency and ionicity; Definition of electronegativity.
Inorganic solid-state materials	3	Structure of important ionic crystals; Stoichiometry and lattice defects; Ionic conduction and solid electrolytes; Crystal field and optical properties of d-block elements.
Fundamentals of diffraction crystallography	5	Generation and properties of X-ray; Fundamentals of X-ray scattering and diffraction (Bragg condition, structure factor, extinction rule); Powder X-ray diffractometry; Laue method
Self-assessment of achievement	1	Review of the course contents

【Textbook】No textbook is required for this course. A course booklet will be given out at the first lecture.

【Textbook(supplemental)】B. D. Cullity and S.R. Stock, Elements of X-Ray Diffraction (3rd ed.), Prentice Hall, 2001 (ISBN 978-0201610918)

L. Smart and E. Moore, Solid State Chemistry: An Introduction (4th ed.), CRC Press, 2012 (ISBN 978 -1439847909)

A. R. West, Solid State Chemistry and Its Applications (2nd ed.), Wiley, 2014 (ISBN 978-1119942948)

【Prerequisite(s)】Knowledge of physics and chemistry for the entrance examination of Kyoto University.

【】

【Web Sites】Not available

【Additional Information】Not available

51250

English for Engineering Science

物理工学英語

【Code】51250 【Course Year】 【Term】 【Class day & Period】 【Location】 【Credits】2 【Restriction】

【Lecture Form(s)】 【Language】English 【Instructor】J. Goodman,

【Course Description】This class will expose you to a variety of scientific and engineering topics, in English, and motivate you to improve your ability to communicate effectively. We will focus on current as well as historical examples of engineered products and scientific discoveries, and examine the benefits and problems that technological advances create. You will explore subjects that are personally interesting to you and try to clarify your goals as future scientists and engineers. Classes consist of short presentations that each of you (or I) gives, followed by open discussion and debate in English. You can use multimedia (computer files, whiteboard, etc.) in your presentations if you want to. We will also examine how these mini-presentations were successful and how they might be improved. The most important step you can take now is to actively increase your English vocabulary. The more words you know and enjoy using, the better you can understand what you read and experience, and the better you can communicate. Get a good dictionary app for your smartphone and/or computer, one that has an “export history” function, and use it often.

【Grading】This course is graded on a pass/fail basis. If you have more than three unexcused absences during the term, you will probably fail the course.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Group seminar	15	Small groups are organized. Classes will be given by a native English speaker.

【Textbook】The class instructor will arrange its contents.

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】- Applicants should attend the guidance.
- The number of registrants for each class is limited (10-15).
- Cancellation is not allowed after classes start.

51252

English for Engineering Science

物理工学英語

【Code】51252 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51253

English for Engineering Science

物理工学英語

【Code】51253 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	14	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50540

Exercise on Engineering Science 1

物理工学演習 1

【Code】50540 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	9	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50541

Exercise on Engineering Science 1

物理工学演習 1

【Code】50541 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

【Lecture Form(s)】 【Language】Japanese 【Instructor】Miyadera, Ogure,

【Course Description】

【Grading】exercises and reports

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Linear algebra	5	
Linear differential equations	5	
Laplace transform	4	
Confirmation of achievement in study	1	

【Textbook】Prints are distributed in the class.

【Textbook(supplemental)】

【Prerequisite(s)】differential and integral, linear algebra

【】

【Web Sites】

【Additional Information】

50542

Exercise on Engineering Science 1

物理工学演習 1

【Code】50542 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	5 〜 6	
	5 〜 6	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50550

Exercise on Engineering Science 2

物理工学演習２

【Code】50550 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50551

Exercise on Engineering Science 2

物理工学演習２

【Code】50551 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4	
	5	
	5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50552

Exercise on Engineering Science 2

物理工学演習２

【Code】50552 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51100

Introduction to Engineering Science A

物理工学総論A

【Code】51100 【Course Year】1st year 【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
	10	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51110

Introduction to Engineering Science B

物理工学総論Ｂ

【Code】51110 【Course Year】1st year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	5	
	4	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50400

Plasma Physics

プラズマ物理学

【Code】50400 【Course Year】3rd year 【Term】 【Class day & Period】Tue 2nd

【Location】Engineering Science Depts Bldg.-101 【Credits】2 【Restriction】No Restriction

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

【Course Description】Fundamental properties of plasma as a universal state of high-temperature matters, basic equation describing plasma, magnetohydrodynamics, plasma waves and transport phenomena are explained.

【Grading】semester-end examination and reports

【Course Goals】to understand basic properties of plasmas and learn fundamental method of analysis

【Course Topics】

Theme	Class number of times	Description
What is a plasma?	2	
Motion of charged particles	2	
Coulomb collision	1	
Basic equations	2	
Equilibrium and stability	1	
Plasma waves	2	
Wave-particle interaction	1	
Transport phenomena	1	
Gas discharge	1	
Nuclear fusion	1	
Confirmation of achievement	1	

【Textbook】Hand out will be distributed

【Textbook(supplemental)】

【Prerequisite(s)】Basic knowledges of electromagnetism, statistical physics, fluid dynamics and atomic physics are expected.

【】

【Web Sites】

【Additional Information】

Radiochemistry

放射化学

【Code】51160 【Course Year】3rd year 【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	
	1	
	2	
	4	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51440

Microfabrication

マイクロ加工学

【Code】51440 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Ryuji Yokokawa, Toshiyuki Tsuchiya

【Course Description】This course covers microfabrication technology for MEMS as well as semiconducors.

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51700

Fabrication and analysis of micromaterials

マイクロ材料の加工・評価の基礎

【Code】51700 【Course Year】4th year 【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
	1	
	1	
	1	
	1	
	1	
	3	
	3	
	1	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51520

Fluid Flow and Heat Transfer

流体熱工学

【Code】51520 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】This lecture provides the following subjects: thermal radiation, steady and unsteady heat conduction, laminar and turbulent convective heat transfer, phase change phenomena (boiling and condensation). The main goals are to understand the basic theory of fluid dynamics, thermodynamics, heat transfer and their allocation through the understandings of the mechanisms of heat transfer; especially thermal hydraulics in a nuclear reactor as a typical energy conversion system will be discussed including a safety engineering point of view.

【Grading】Evaluation based on the written examination, but it is also rating a student's class performance.

【Course Goals】In order to understand the relation between heat and fluid based on the basic theory of fluid dynamics, thermodynamics, heat transfer and their allocation. It is very important to

【Course Topics】

Theme	Class number of times	Description
	1.0	
	1.0	
	2.0	
	4.0	
	1.0	
	5.0	
	1 .0	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51420

Fluid Dynamics1

流体力学１

【Code】51420 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51430

Fluid Dynamics 2

流体力学 2

【Code】51430 【Course Year】3rd year 【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
	2	
	4	
	2	
	3	
	1	
	2	
	1	

【Textbook】

【Textbook(supplemental)】G. K. Batchelor, An Introduction to Fluid Dynamics (Cambridge University Press, 1967). , (同 , 2000)

【Prerequisite(s)】Fluid Dynamics 1

【】

【Web Sites】

【Additional Information】

51431

Fluid Dynamics 2

流体力学２

【Code】51431 【Course Year】3rd year 【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
	2	
	3	
	3	
	6	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51090

Quantum Radiation Detection

量子線計測学

【Code】51090 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Tsuchida Hidetsugu,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50410

Fundamentals of Atomic Interactions in Matter

量子反応基礎論

【Code】50410 【Course Year】3rd year 【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	
	4	
	2	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

51480

Introduction to Solid State Physics

量子物性基礎論

【Code】51480 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Matsuo and Seki,

【Course Description】Gain working understanding of periodicity in solids and how this periodicity and bonding governs solid properties, such as electrically magnetically and mechanically. To describe how quantum mechanics defines solid state properties on a microscopic and macroscopic scale.

【Grading】Coursework will be evaluated with attendance and report on subjects.

【Course Goals】To further develop the understanding of interactions between solid state and phonons, electrons and particles on a microscopic scale.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Revision of ccrystal type and structure
Free electron model	3	Wave function theory of one dimensional lattice, energy state and Fermi surface
Band structure	3	Bloch’s theory, Brillouin zone, Laue law, diffraction and structural factor
Defects and dislocations	2	Vacancy, diffusion, color center
Optical property	2	Kramers-Kronig relation, Drude theory, electron gas, Plasmon
Semiconductor	1	Band gap, electrons and holes, Homogeneous semiconductor, doping
Junction theory	1	p-n junctions, metal-semiconductor junction, hetero-junction
Final examination and report	2	Evaluation will be given by the contents of the reports and quizzes of the subjects leaned in this course.

【Textbook】

【Textbook(supplemental)】C. Kittel, Introduction to Solid State Physics 8th edition (Wiley)

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50180

Quantum Physics 1

量子物理学 1

【Code】50180 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】examination and homework

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction	1~2	
Fundamentals of quantum mechanics	4	
Particles motion in one dimension	2~3	
Harmonic oscillator	2~3	
Atomic structure	4	
Assessment of achievement	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50181

Quantum Physics 1

量子物理学 1

【Code】50181 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】examination and homework

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction	1~2	
Fundamentals of quantum mechanics	4	
Particles motion in one dimension	2~3	
Harmonic oscillator	2~3	
Atomic structure	4	
Assessment of achievement	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50182

Quantum Physics 1

量子物理学 1

【Code】50182 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Miyadera,

【Course Description】

【Grading】examination

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction	2	
Fundamental framework of quantum theory	4	
Quantization	3	
Particle motion in one dimension	3	
Harmonic oscillator	2	
WKB approximation	2	
Particle motion in three dimensions (2)	1	
Confirmation of achievement in study	1	

【Textbook】

【Textbook(supplemental)】Modern Quantum Mechanics (J.J.Sakurai)
Lectures on Quantum Theory (C.J. Isham)

【Prerequisite(s)】Classical mechanics, Linear algebra

【】

【Web Sites】

【Additional Information】

50190

Quantum Physics 2

量子物理学 2

【Code】50190 【Course Year】4th year 【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
	3	
	3	
	1 ～ 2	
	1 ～ 2	
	2	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50192

Quantum Physics 2

量子物理学 2

【Code】50192 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Miyadera,,

【Course Description】

【Grading】examination

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Fundamental framework of quantum mechanics	2	
Angular momentum	3	
Central potential	2	
Perturbation theory (stationary method)	2	
Perturbation theory (interaction picture)	2	
Many particle system	2	
Recent developments	1	
Confirmation of achievement in study	1	

【Textbook】

【Textbook(supplemental)】Modern Quantum Mechanics (J.J.Sakurai)
Lectures on Quantum Theory (C.J. Isham)

【Prerequisite(s)】Quantum Physics 1

【】

【Web Sites】

【Additional Information】

51650

Electronic Structures of Inorganic Materials 1

量子無機材料学 1

【Code】51650 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Isao TANAKA,

【Course Description】Electron theory is essential for fundamental understanding of the relationship among properties, crystal structure and chemical composition in wide variety of inorganic crystals. This course provides an introduction to the basic electron theory to be used to describe the electronic structures of inorganic materials in general.

【Grading】Final exam.
Some quiz-sheets are distributed at the lecture whose answers should be submitted on site. Their scores may count as a portion of the cumulative grade.

【Course Goals】This course provides an introduction to the basic electron theory to be used to describe the electronic structures of inorganic materials in general.

【Course Topics】

Theme	Class number of times	Description
Introduction to quantum theory	3	Description of electrons, Schroedinger equation
Electronic structures of isolated atoms	3	hydrogen-like atoms, quantum numbers, many-electron atoms, self-consistent method, electron spin
Electronic structure of simple molecules	3	molecular orbital method, homo/hetero nuclear diatomic molecules, chemical bondings
Electronic structures of crystals	4	electronic structure of monoatomic crystals and binary compounds, 1D chain of hydrogen atoms, Bloch theorem, band calculations
Application to materials science	1	Density functional theory calculations and their application to materials science
Assessment of mastery of the course content	1	Assessment of mastery of the course content

【Textbook】The textbook for this lecture (in Japanese) can be purchased at a bookstore.

【Textbook(supplemental)】Standard textbooks for elementary quantum physics, quantum chemistry and solid state theory may be used.

【Prerequisite(s)】Understanding of contents for Basic Phys. Chemistry(quantum theory) is preferred.

【】Support materials are available on KULASIS. Password is given in the lecture room.
They may be used for reviewing.

【Web Sites】

【Additional Information】

51660

Electronic Structures of Inorganic Materials 2

量子無機材料学 2

【Code】51660 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Atsuto Seko

【Course Description】It is important to understand the electronic structure of materials because of its determinantal impacts on material functions. This lecture gives the fundamentals of electronic structure calculations based on quantum chemistry and band theory. The relationship between the electronic structure of inorganic materials and their functions is also discussed.

【Grading】Evaluations are made based on the examination. The results of quizzes and reports may be considered.

【Course Goals】Learning the fundamentals of quantum chemistry and band theory, and their applications to the issues in materials science.

【Course Topics】

Theme	Class number of times	Description
Electronic structure theory for materials science	1	The roles of electronic structure theory in materials research and development.
Fundamentals of electronic structure theory	2	The characteristics and physical meanings of wavefunctions, total energy, and one-electron energy.
Theory, approximations, and methods in quantum chemistry (1)	4	Variational method and perturbation method.
Theory, approximations, and methods in quantum chemistry (2)	3	Hartree and Hartree-Fock approximations in quantum chemistry.
Electronic band structure calculation	2	Density functional theory, pseudopotential and basis set in electronic band structure calculation.
Electronic structure and chemical bonding of molecules and solids	2	The electronic structure and chemical bonding of molecules and solids.
Assessment of mastery of the course content	1	The mastery of the course content is assessed.

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50200

Continuum Mechanics

連続体力学

【Code】50200 【Course Year】3rd year 【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
Basic assumptions	1	
Vectors and tensors	2	
Fundamental laws	2	
Constitutive framework	3	
Potential theories	2	
Wave motions	2	
Stabilities	2	
Examination	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

50201

Continuum Mechanics

連続体力学

【Code】50201 【Course Year】3rd year 【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	
	2	
	2	
	2	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

21050

Engineering Ethics
工学倫理

【Code】21050 【Course Year】4th year 【Term】2018 first semester 【Class day & Period】Thu 3rd 【Location】Research Bldg. No.8, 3F, NS Hall 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Dean of the Faculty of Engineering
Graduate School of Engineering, Professor, Makoto OHSAKI
Graduate School of Energy Science, Professor, Hirohiko TAKUDA
Graduate School of Engineering, Junior Associate Professor, Ryosuke MATSUMOTO

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

【Grading】Class participation and reports.

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

【Course Topics】

Theme	Class number of times	Description
Significance to learn engineering ethics(4/12)	1	This class gives students explanation about what engineering ethics is and the reason why it is necessary to learn it introducing some troubles in the field of transportation engineering and planning. (N. Uno: Global Engineering)
Ethics in information society on the view point of information technology(4/19)	1	Information devices such as PCs and smartphones and various web services such as SNS are very convenient, but there are also risks of being dangerous depending on usage. In this lecture, we describe the knowledge and the code of conduct to live safely in the information society. (A. Yamamoto: Informatics and Mathematical Science)
(4/26)	1	(M. Mizutani: Graduate School of Letters)
Ethical theories for engineering ethics (5/10)	1	This lecture will focus on basic ethical theories such as utilitarianism, deontology and virtue ethics which will be useful for thinking about particular ethical problems in engineering ethics. (S. Kodama: Graduate School of Letters)
Ethics in Architectural Engineering(5/17)	1	Discussions will be held to increase the ability as engineers to responsibly confront moral issues in the field of building engineering using actual technological activities as examples, such as putting water into fresh concrete, falsification of earthquake-resistance data, shoddy workmanship and architect qualification fraud. (M. Nishiyama: Architecture)
Engineering ethics in operation and maintenance of structures(5/24)	1	Although operation and maintenance of structures such as a plant and an aircraft require enormous labor and cost, unsuitable operation and maintenance may lead to serious accidents that cause unmeasurable damage. This class discusses engineering ethics that engineers are required under the situation. (T. Hayashi: Engineering Science)
Research and engineering ethics(5/31)	1	It is said that He that will do no ill, must do nothing that belongs thereto. The sense of ethics necessary to whom conducts research and engineering work in society is discussed in terms of the importance of equitability and fair evaluation to anyone involved in each area of research or engineering. (H. Mikada: Global Engineering)
Patents and Ethics (Part 1)(6/7)	1	This course will teach the students about 1) patent systems which protect inventions and research results and 2) ethical issues in patents. The first class, in preparation for the next subject of patent ethics, introduces Japan ’ s patent system with comparisons to the patent systems in the world ’ s major countries and international framework. (M. Nakagawa: Electrical and Electronics Engineering)
Patents and Ethics (Part 2) (6/14)	1	Students, equipped with the basic knowledge of patent systems by the previous lecture, will get familiar with actual case studies on ethical and legal issues in patents. (M. Nakagawa: Electrical and Electronics Engineering)
Ethics Required for Advanced Science(6/21)	1	Engineers and researchers are at the forefront of preventing harm caused by advanced chemistry. Think about social roles and ethics required by engineers and researchers through relationships between chemical substances and environmental problems, efforts to avoid hazards of nanomaterials. (K. Miura: Industrial Chemistry)
Ethics in nuclear engineering(6/28)	1	Nuclear technology can brew up an expansive and long-running catastrophe as well as it brings significant value of stable electricity in normal times. Some examples of ethics in nuclear engineering are introduced and important issues are talked. (I. Takagi: Engineering Science)
Ethics in biomedical engineering(7/5)	1	Recent dramatic progress in biology-related techniques, such as reproductive medicine, genome editing, and clone-animal techniques, is causing revolutions in the fields of medicines and food productions. Associated with it, problems of their safety and ethics are arising, which should be addressed by our societies. In this class, the recent progress in biology-related techniques, and problems we have and will have in near future are described. (M. Shirakawa: Industrial Chemistry)
Ethics of biotechnology and stem cell research(7/12)	1	With the rapid development of genome editing technology and stem cell engineering, editing of the human genome that goes beyond generations has become possible, at least technically. In this lecture, I will introduce these latest technologies and think about ethical problems accompanying technological development. (G. Eiraku: Industrial Chemistry)
Art-view Concept for Engineering(7/19)	1	Concept of "quality of life" is required for human related engineering. Some practical examples in medical-care and welfare fields will be introduced, and problem of the QOL-evaluation will be discussed from both function-optimizing view point and art view point. (N. Tomita: Engineering Science)
Ethics for Civil Engineers (7/26)	1	Civil Engineers play a key role on development of social infrastructures to protect people's lives from natural disasters and to support social and economic activities. This lecture introduces the engineering ethics on development of social infrastructures with specific examples. (T. Yagi: Global Engineering)

【Textbook】Lecture materials will be distributed.

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】The class order is subject to change.

21080

Introduction to Engineering

工学序論

【Code】21080 【Course Year】1st year 【Term】 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1~2	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

22210

Engineering and Economy(in English)

工学と経済（英語）

【Code】22210 【Course Year】2nd year and above 【Term】2018 first semester 【Class day & Period】Tuesdays 5th-6th

【Location】工学部総合校舎１１１講義室 【Credits】2 【Restriction】【Lecture Form(s)】【Language】English 【Instructor】Juha Lintuluoto

【Course Description】The purpose of this course is to teach economy from an engineer viewpoint. The course especially contains such economic topics which engineer can use to solve practical engineering economy problems. The course is consisted of lectures and additional exercises, of which the student should complete five (5) written short reports and five (5) 60 minutes laboratory session attendances. The laboratory sessions are held weekly after the lecture, and consist of interactive group work tasks. Laboratory sessions are held weekly from 18 to 19 o’clock.// The course is aimed for both Japanese and Foreign nationals.// The course starts on April 10th.

【Grading】Test, reports, laboratory performance.

【Course Goals】This course will provide tasks for engineering students to be able to understand relationships between engineering and engineering economy. Students will learn solving economic problems related to engineering project at various levels. The course also prepares the students to write engineering related economic topics in English as well as verbally express themselves of these subjects.

【Course Topics】

Theme	Class number of times	Description
Student orientation, Introduction to engineering economy	1	Course introduction; Principles of engineering economy
Cost concept	1	Cost terminology; Competition; Total revenue function; Breakeven point
Design economics	1	Cost-driven design; Making vs. purchasing; Trade-offs
Cost estimation techniques I	1	Integrated approach and WBS; Index, unit, and factor techniques
Cost estimation techniques II	1	Parametric estimating; Power-sizing technique; Learning curve; Cost estimation, bottom-up, top-down, target costing
The time value of money I	1	Simple interest; Compound interest; Equivalence concept;Cash-flow digrams
The time value of money II	1	Present and future equivalent values of single cash flows
The time value of money III	1	Uniform series cash flows; Deferred annuities; Uniform gradient cash flows; Nominal and effective interest rates
Evaluation of a single project I	1	Determining minimum attractive rate of return (MARR); The present worth method; Bond value; Capitalized-worth method
Evaluation of a single project II	1	The future worth method; The annual worth method; The internal rate of return method; The external rate of return method
Comparison and selection among alternatives I	1	Basic concepts; The study (analysis) period; Useful lives are equal to the study period
Comparison and selection among alternatives II	1	Useful lives are unequal to the study period; Repeatability; Cotermination; The imputed market value technique
Income taxes and depreciation	1	Concepts and terminology; Depreciation; Straight-line method; Declining-balance method; Income taxes; Marginal tax; Gain or loss on the disposal of an asset; After-tax economic analysis
Final test	1	The test is based on the above topics

【Textbook】Sullivan, Wicks, Koelling; Engineering Economy, 15th Ed. 2012 , Chapters 1-7.

【Textbook(supplemental)】

【Prerequisite(s)】Note:

-Interactive lessons (discussion), Small group working method

-This course is held in English.

【】

【Web Sites】None

【Additional Information】If you have any questions or need further information, feel free to contact at 090aglobal@mail2.adm.kyoto-u.ac.jp.

24010

Global Leadership Seminar I

ＧＬセミナーＩ（企業調査研究）

【Code】24010 【Course Year】 【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
	1	
	2~3	
	2~3	
	12	
	3~4	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

25010

Global Leadership Seminar II

ＧＬセミナーⅡ（課題解決演習）

【Code】25010 【Course Year】2nd year or higher 【Term】FY2018, 2nd semester, intensive
【Class day & Period】Intensive course 【Location】Announced elsewhere 【Credits】1
【Restriction】Restricion in number to around 20 selected students 【Lecture Form(s)】Lecture and excercise
【Language】
【Instructor】Faculty of Engineering, J. Assoc. Prof., Yoshinori Tanaka
Faculty of Engineering, J. Assoc. Prof., Ryuichi Ashida
Faculty of Engineering, J. Assoc. Prof., Aiko Takatori
Faculty of Engineering, J. Assoc. Prof., Tadao Mizuno
Faculty of Engineering, J. Assoc. Prof., Ryosuke Matsumoto
Related professors
【Course Description】This course is a small-group workshop program where students are supposed to extract or set up challenges by themselves aiming at creating new social values. In concrete, abilities of planning and problem-solving are trained through group works in residential training and skills of presentation and communication are enhanced through oral presentations regarding contents of the proposal at each step of the process from a preliminary draft to its completion.
【Grading】It is required to join the residential training. A report meeting is held and comprehensive evaluation concerning abilities in group discussion to extract or set up challenges and to propose solutions for achieving a goal is made through presentation of the proposal as well as a submitted report.
【Course Goals】Ability of planning, from extraction or setting up challenges to proposal of solutions aiming at creating new social values, is trained through group works.
【Course Topics】

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

【Textbook】Will be indicated as necessary.
【Textbook(supplemental)】Will be indicated as necessary.
【Prerequisite(s)】
【】
【Web Sites】
【Additional Information】Course open period: October to January
How to register the course will be instructed.
*It depends on divisions which students belong to whether the earned credits are admitted as credits required for graduation. Please refer to the syllabus of your division.

24020

International Internship of Faculty of Engineering I

工学部国際インターンシップ１

【Code】24020 【Course Year】Junior and Senior students 【Term】Through the academic year

【Class day & Period】Intensive course 【Location】Defined in each internship program. 【Credits】1

【Restriction】Defined in each internship program 【Lecture Form(s)】Exercise 【Language】English, et al.

【Instructor】Chairperson of Foreign Students and International Academic Exchange Subcommittee, Faculty members in charge of educational affairs of the undergraduate school the registrant belongs to.

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

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

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

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Described in the application booklet for each internship program. The registrant is requested to have enough language skills for the participation.

【】

【Web Sites】

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

25020

International Internship of Faculty of Engineering 2

工学部国際インターンシップ２

【Code】25020 【Course Year】Junior and Senior students 【Term】Through the academic year

【Class day & Period】Intensive Course 【Location】Defined in each internship program. 【Credits】2

【Restriction】Defined in each internship program. 【Lecture Form(s)】Exercise 【Language】English, et al.

【Instructor】Chair of Foreign Students and International Academic Exchange Subcommittee, Faculty members of the Undergraduate School the registrant belongs to.

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

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

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

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Described in the application booklet for each internship program. The registrant is requested to have enough language skills for the participation.

【】

【Web Sites】

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

50271

Control Engineering 2

制御工学 2

【Code】50271 【Course Year】3rd year 【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	
	2	
	2	
	2	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

工学部シラバス 2018 年度版
（[C] Engineering Science）

2018 年 4 月 1 日発行（非売品）

編集者　京都大学工学部教務課
発行所　京都大学工学部
〒 606-8501 京都市左京区吉田本町

デザイン　工学研究科附属情報センター

工学部シラバス 2018 年度版

・ Common Subjects of Faculty of Engineering
・[A] Global Engineering
・[B] Architecture
・[C] Engineering Science
・[D] Electrical and Electronic Engineering
・[E] Informatics and Mathematical Science
・[F] Industrial Chemistry
・**オンライン版**　http://www.t.kyoto-u.ac.jp/syllabus-s/

本文中の下線はリンクを示しています．リンク先はオンライン版を参照してください．

オンライン版の教科書・参考書欄には 京都大学蔵書検索 (KULINE) へのリンクが含まれています．

京都大学工学部 2018.4