SYLLABUS *2014*

[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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Exercise 【Language】 【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】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【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】1st term 【Class day & Period】 【Location】 【Credits】3

【Restriction】 【Lecture Form(s)】 【Language】 【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】2nd term 【Class day & Period】 【Location】 【Credits】3

【Restriction】 【Lecture Form(s)】 【Language】 【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】

51390

Energy chemistry 1

エネルギー化学１

【Code】51390 【Course Year】3rd year 【Term】1st 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
	2	
	3	
	2	
	3	
	2	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51400

Energy chemistry 2

エネルギー化学２

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

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

【Course Description】The lecturer teaches the elements, chemical compounds and chemical reactions which are the basis for understanding the conversion and utilization of energy. In order to deepen the understanding, he also explains the relationships between the contents of textbook and the examples of everyday life or recent research.

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Oxidation and Reduction 1	2	Standard electrode potential, Nernst equation, proportionation and disproportionation reactions, Latimer, Frost, Pourbaix diagrams
Oxidation and Reduction 2	3	Chemical reduction, production of simple substance, Ellingham diagram, topics related with energy/resources/recycle
Hydrogen and Its Compounds	2	Hydrogen and its compounds, applications to energy conversion and storage
Group 1 and 2 elements	2	simple substance, hydrogen compounds, topics related with energy/resources/recycle
Group 13 and 14 elements	3	boron and its compounds, aluminum and its compounds, graphite, diamond, fullerene, carbon nanotube, various carbon materials, silicon, solar cells
Group 15 and 16 elements	3	nitrogen, ammonia, oxygen, sulfur, topics related with energy, check of understanding

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】 【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Shioji・Nakabe

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50231

Energy Conversion

エネルギー変換工学

【Code】50231 【Course Year】3rd year 【Term】1st 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
	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】1st 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
	2	
	5	
	2	
	5	

【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】1st 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

【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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	3	
Structure of nuclei	4	
Alpha decays and fission	3	
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】1st 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
	3	
	2	
	2	
	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】2nd term 【Class day & Period】 【Location】 【Credits】1

【Restriction】 【Lecture Form(s)】Seminar 【Language】 【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
About 20 topics will be proposed.		

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Seminar 【Language】 【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】1st+2nd 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	
	2	
	2	
	2	
	2	
	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】1st+2nd 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	
	2	
	2	
	2	
	2	
	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】1st+2nd 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	
	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】2nd term 【Class day & Period】 【Location】 【Credits】1 【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【Instructor】

【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. The credit is given in pass/fail basis.

【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Seminar 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4	
	3	
	-	
	21	
	21	
	21	

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Seminar 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	14	

【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】1st 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
	2	
	4	
	6	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50770

Machine Elements

機械要素学

【Code】50770 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Gasdynamics

気体力学

【Code】50450 【Course Year】3rd year 【Term】1st 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
	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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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	
Phase Diagrams of Steels and Aluminum Alloys	2	
Deformation, Recovery, Recrystallization and Grain Growth	3	
Heat Treatment in Steels	3	
Heat Treatment in Aluminum Alloys	2	
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】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50030

Mathematics for Computation

計算機数学

【Code】50030 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50090

Scientific Measurement

計測学

【Code】50090 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【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	1-2	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】2nd 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

【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】1st 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
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】1st term 【Class day & Period】 【Location】 【Credits】3

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1-2	
	1	
	1	
	1	
	1-2	
	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】2nd term 【Class day & Period】 【Location】 【Credits】3

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1-2	
	1	
	1	
	1	
	1	
	1	
	1	
	1-2	
	2	
	1	
	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】1st 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
	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】2nd 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
	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】2nd 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

【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】 【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】1st 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
	4	
	4	
	3	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Applied Mathematics A1

工業数学 A1

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

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Hitoshi Yoshikawa

【Course Description】The theory of analytic functions of one complex variable

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

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

【Course Topics】

Theme	Class number of times	Description
The plane of one complex variable and elementary functions	3	After describing the point-set topology of the plane of one complex variable, elementary functions are introduced with their properties.
Complex integrals and Cauchy's theorem	3	Cauchy's theorem and Cauchy's integral formula are shown along with outstanding properties of analytic functions. An example is given of Cauchy's theorem.
Power series	2	Sequences, series, and series of functions are discussed with the notion of convergence and divergence.
Taylor's expansio0n and Laurent's expansion	3	The Taylor series of analytic functions and the Laurent series of analytic functions on an annulus are discussed together with some examples.
Singularity and residues	3	The calculus of residues is dealt with. Examples are given of integral evaluations.
Learning achievement test	1	Learning achievement test.

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Calculus, Linear algebra

【Web Sites】

【Additional Information】

20600

Applied Mathematics A2

工業数学 A2

【Code】20600 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Nakamura Yoshimasa

【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.

【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, the power method and the inverse iteration, the QR method and the divide & conquer method with the Householder transformations for preprocessing
matrix singular value decomposition	1	computation of matrix singular value decomposition (SVD) by the QR method
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

【Textbook】"Numerical Computation" (in Japanese) by H. Sunouchi and E. Ishiwata, SAIENSU-SHA

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

【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】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】The theory of Fourier analysis

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

【Course Goals】To understand fundamental theory of Fourier and Laplace analysis with a skill for evaluation of specific examples and applications in applied mathematics and physics.

【Course Topics】

Theme	Class number of times	Description
Fourier series	4-5	Introduction of the Fourier series for periodic functions. Best approximation property and the convergence of this series are shown. Discrete Fourier transform is also discussed.
Applications of Fourier series	3-4	Application of Fourier series to differential equations
Fourier transform	3-4	Introduction of the Fourier transform for L^2 functions. Invertibility of this transform and the convolution theorem are shown.
Applications of Fourier transform related	2-3	Application of Fourier series to differential equations. The relationship with Fourier transform and Laplace transform.
Summary and assessment	1	Summary and supplement of this course. Measure the progress of students in acquiring knowledge and skills.

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

【Textbook(supplemental)】S. Oishi: Fourier analysis, Iwanami shoten

【Prerequisite(s)】Calculus, Linear algebra

【Web Sites】http://www-is.amp.i.kyoto-u.ac.jp/lab/tujimoto/amathA3/

【Additional Information】

20550

Applied Mathematics for Engineering F1

工業数学Ｆ１

【Code】20550 【Course Year】2nd year 【Term】2nd term 【Class day & Period】Tue 3rd
【Location】313 (Kawanabe), 315 (Fukuyama) 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture
【Language】Japanese 【Instructor】Kawanabe (20550), Fukuyama (20551)
【Course Description】Introduction to complex analysis and some applications
【Grading】Regular examination (Kawanabe), Regular examination and Reports (Fukuyama)
【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】Not used
【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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	2	Fourier series expansion of periodic functions is described.
Characteristics of Fourier series	2	Differential and integral of Fourier series, complex Fourier series, and the best approximation problem are described.
Fourier transform	2-3	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	2	
Auto-/Cross-correlation function	1	
Partial differential equations	1-2	Applications to partial differential equations are described.
Discrete Fourier transform	1	
Laplace transform	1-2	Laplace transform and its characteristics are described along with an application of solving ordinary differential equations.
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】1st term 【Class day & Period】 【Location】 【Credits】2

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

【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】1st term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Akira Sakai
【Course Description】Fourier analysis, Laplace transform and their applications.
【Grading】Each lecture accompanies a half-hour exercise with two problems. The grading is made based on the total score earned in these exercises plus the result of regular examination.
【Course Goals】The final goal of this course is to understand basics of Fourier series expansion, Fourier transform, and Laplace transform, 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 and their applications	15	Complex numbers and complex analysis -complex numbers and complex functions -complex integrals, residue theorem, and their applications Delta function Fourier series expansion -periodic functions and their Fourier series expansion -complex Fourier series expansion -applications of Fourier series Fourier transform -basics of Fourier transform -convolution and correlation function -applications of Fourier transform -linear response system Laplace transform and its applications -basics of Laplace transform -applications of Laplace transform to linear systems Linear differential equations -solving linear differential equations using Fourier transform -solving linear differential equations using Laplace transform Thermal conduction/diffusion equation -thermal conduction/diffusion equation in an infinite/semi-infinite interval -thermal conduction/diffusion equation in a finite interval -thermal conduction/diffusion equation with time-dependent boundary conditions Wave equation -wave equation in an infinite/semi-infinite interval -wave equation in a finite interval -equation of forced oscillation
Exercise		Each lecture accompanies a half-hour exercise with two problems. Comments on the students' answers on one exercise will be shown in print and circulated in the next lecture.

【Textbook】Lecture notes are distributed at the class.
【Textbook(supplemental)】Shin-ichi Oh-ishi, "Fourier analysis" (in Japanese), Iwanami, 1989
【Prerequisite(s)】Prerequisite subjects: complex numbers and basic calculus.
【Web Sites】Lectures notes in a PDF format can be accessed through KULASIS.
【Additional Information】

20653

Applied Mathematics for Engineering F2

工業数学Ｆ２

【Code】20653 【Course Year】3rd year 【Term】1st 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
	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】2nd term 【Class day & Period】 【Location】 【Credits】2

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

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

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

【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】

20800

Engineering Mechanics A

工業力学 A

【Code】20800 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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】1st 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
	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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】 【Instructor】Kei Senda

【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
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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Seminar and Exercise 【Language】 【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】1st term 【Class day & Period】 【Location】 【Credits】1

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	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】2nd term 【Class day & Period】 【Location】 【Credits】1

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	3	
	3	
	3	

【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】1st 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
	2-3	
	5-6	
	3-4	
	3-4	

【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】2nd 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51210

Electon Theory of Solids

固体電子論

【Code】51210 【Course Year】3rd year 【Term】1st 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
	4	
	3	
	4	
	3	
	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】1st 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
	1	
	3~4	
	3~4	
	2	
	3~4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51470

Condensed Matter Physics

固体物性論

【Code】51470 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】H. Nakamura and Y. Tabata

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Review of electromagnetism	3	
Optical properties of matter	3	
Magnetism	5	
Superconductivity	3	
Assessment	1	

【Textbook】None

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50120

Solid State Physics

固体物理学

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Crystal and lattice. Diffraction by crystal, Bonding energy of crystal	2	
Phonon	2	
Introduction to statistical mechanics, Specific heat of solid	3	
Introduction to quantum mechanics	3	
Free electron model. Thermal and transport properties of metal	3	
Electrons in periodic potential	1	
Assessment	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50510

Mechanics of Solids

固体力学

【Code】50510 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】S. Biwa

【Course Description】While approximate methods of stress-strain analysis for elementary structural members are main topics in in "Mechanics of Materials" courses, 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, Hooke's law and its thermodynamic background are treated together with mathematical analysis of static deformations in elastic bodies.

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

【Course Goals】This course aims to establish understanding of three-dimensional and 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
Vectors and tensors	1	Components of vectors and stresses; Basis vecotrs; Kronecker's delta; Alternating symbol; Summation convention
Stress	2	Notion of stress; Cauchy's relation; Transformation of stress components; Equilibrium equations; Symmetry of stress; Principal stresses and stress invariants
Strain	2	Mathematical expressions of deformation; Green-Lagrange strain; Infinitesimal strain; Transformation of strain components; Principal strains
Thermodynamics of elastic solids	1	Thermodynamics of elastic bodies; Thermoelasticity; Hooke's law
Fundamental equations of elasticity	2	Navier's equations; Plane stress and plane strain; Compatibility relation for strain
Theoretical analysis 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
Energy principles	2	Principle of virtual work; Principle of complementary virtual work; Principle of minimum potential energy
Applications of elasticity	2	Anisotropic elastic property of composite materials; In-plane elastic property of laminated plates

【Textbook】No textbooks are assigned. The lecture is given in a "blackboard" style.

【Textbook(supplemental)】T. Kunio, "Fundamentals of Solid Mechanics" (Baihu-kan) ;
S. Kobayashi and K. Kondo, "Elasticity" (Baihu-kan) ;
T. Inoue, "Fundamentals of elasticity" (Nikkan Kogyo)
(all in Japanese) .
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 and vector analysis is preferable.

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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	2	
Diffusion in solids	4	
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】2nd 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

【Textbook】

【Textbook(supplemental)】

【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】1st term 【Class day & Period】 【Location】 【Credits】3

【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【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】2nd term 【Class day & Period】 【Location】 【Credits】3

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50080

Fundamentals of Materials 1

材料基礎学 1

【Code】50080 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

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

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】isbn:4901381008

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】The class will be called off till end of the fiscal year(2012).

50082

Fundamentals of Materials 1

材料基礎学 1

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

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

【Lecture Form(s)】Lecture 【Language】 【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	2	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	3	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】1st 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

【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】1st 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

【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】2nd 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51670

Fundamentals of Microstructure of Materials 1

材料組織学１

【Code】51670 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Nobuhiro Tsuji, Hideyuki Yasuda

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51680

Fundamentals of Microstructure of Materials 2

材料組織学 2

【Code】51680 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

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

【Grading】Examination, record of attendance

【Course Goals】To undersand microstructure development systematically with knowledge of thermodynamics and kinetics

【Course Topics】

Theme	Class number of times	Description
Fundamentals	2	
Nucleation	1	
Interface (atomic scale)	1	
Interface morphology	2-3	
Dendritic growth	1-2	
Eutectic growth	1	
non-equilibrium solidification	1	
Phase & microstructure selection, phase diagram	3	
Exam	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51020

Electrochemistry for Materials Processing

材料電気化学

【Code】51020 【Course Year】3rd year 【Term】1st 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51340

Statistical Physics of Materials

材料統計物理学

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
First law of thermodynamics	1	
Second law of thermodynamics	1	
Thermodynamic functions	3	
Irreversible process	1	
Concept of statistical thermodynamics	2	
Basic of classical statistical thermodynamics	5	
Quantum statistical thermodynamics	1	
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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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】2nd 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
	1	
	2	
	4	
	3	
	4	
	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】2nd 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
	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】1st term 【Class day & Period】 【Location】 【Credits】2

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

【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】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Jun Kawai

【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", AGNE Gijutsu Center, Tokyo (2008)

【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】1st 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
	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】1st 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
	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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】 【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】 【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】

50050

Mechanics of Materials 2

材料力学２

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

【Restriction】 【Lecture Form(s)】Lecture 【Language】

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】

【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.

50052

Mechanics of Materials 2

材料力学 2

【Code】50052 【Course Year】2nd year 【Term】2nd 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51280

Systems Engineering

システム工学

【Code】51280 【Course Year】4th year 【Term】1st 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
	2	
	2	
	2	
	3	
	2 〜 3	
	3	

【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】2nd 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
	4	
	2	
	4 〜 5	
	1 〜 2	
	1 〜 2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50280

Fundamentals of Artificial Intelligence

人工知能基礎

【Code】50280 【Course Year】4th year 【Term】1st 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50240

Vibration Engineering

振動工学

【Code】50240 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	3	
	1	
	4	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50241

Vibration Engineering

振動工学

【Code】50241 【Course Year】3rd year 【Term】1st 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50750

Reliability Engineering

信頼性工学

【Code】50750 【Course Year】4th year 【Term】1st 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

【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】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Propulsion Fundamentals	1	
	2	
Ionized Gases	1	
Electromagnetics	2	
Equation of Ionized Gases	1	
Atomic and Molecular Collisions	2	
Diffusion and Transport of Ionized Gases	2	
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, 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, 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) ;
M.A. Lieberman and A.J. Lichtenberg, Principles of Plasma Discharges and Materials Processing (Wiley, New York, 1994) .

【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】2nd 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
	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】1st 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50250

Control Engineering 1

制御工学 1

【Code】50250 【Course Year】 【Term】1st 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
	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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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)】none

【Prerequisite(s)】Elementary knowledge of Laplace Transform may be helpful.

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Kenji Fujimoto

【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】2nd 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
	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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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.
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.
Plant Maintenance	1	The concept of the reliability and maintainability of a manufacturing facility and how to evaluate them are introduced. Typical maintenance policies, how to chose among them, TPM, etc. are also covered.

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

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

50960

Radiation Biophysics

生物物理学

【Code】50960 【Course Year】3rd year 【Term】1st 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
	2	
	2	
	2	
	1	
	1	
	1	
	2	
	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】1st 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

【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】1st 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

【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】2nd 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

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

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

60681

Electric Circuits and Differential Equations

電気回路と微分方程式

【Code】60681 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	5	
	1	
	6	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51530

Heat transfer

伝熱工学

【Code】51530 【Course Year】3rd year 【Term】2nd 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
	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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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
Concept of statistica physics	3	- Thermodynamics vs. statistical mechanics - Review of basic statistics - Counting microscopic states
Ensemble and 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	3	- 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)】

【Web Sites】

【Additional Information】Basic knowledge of thermodynamics, calculus, statistics, analytical mechanics, and quantum physics will be useful.

50731

Statistical Thermodynamics

統計熱力学

【Code】50731 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Masao 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	1-2	Basic ideas of Statistical Thermodynamics, thermal equilibrium, fundamentals of Statistics, means of measuremnts, ergodic theory.
Themodynamic functions	1-2	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)
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―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】Speciality of instructor can be seen in http://web1.kcn.jp/silicide/,however, it is a Japanese homepage.

【Additional Information】2nd year students may undestand this lecture if they catch on basics of physics.

51300

Statistical Mechanics

統計力学

【Code】51300 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【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】 【Location】 【Credits】2

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

【Instructor】J. Kawai (50370), K. Ishihara/T. Sagawa/H. Okumura (50371)

【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
Momentum transport	2	Newton's law of viscosity, Equation of continuity
Non-steady mass transport	2	Systems with more than one variables, Energy equation
Heat conduction	2	Fourier's law, Steady heat conduction
Energy transport	3	Non-steady heat conduction, heat transfer, thermal radiation
Mass transport	2	Fick's law, mass transport in solidand in laminar flow
Complex transport phenomena	3	Non-isothermal mixing, mass transfer coefficient, heat and mass transport across an interface
Achievement check	1	Learning how to solve the problems through practical exercises.

【Textbook】(50370) 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) . (50371)R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, Transport Phenomena, 2nd Edition, Wiley (2002) .

【Textbook(supplemental)】

【Prerequisite(s)】

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

【Additional Information】

50460

Thermodynamics and Statistical Mechanics

熱統計力学

【Code】50460 【Course Year】3rd year 【Term】1st 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51620

Thermodynamics 1

熱力学１

【Code】51620 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51621

Thermodynamics 1

熱力学１

【Code】51621 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Thermodynamics 1

熱力学１

【Code】51622 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	6	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Thermodynamics 2

熱力学２

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	6	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50072

Thermodynamics 2

熱力学２

【Code】50072 【Course Year】2nd year 【Term】2nd 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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

50870

Quality Control

品質管理

【Code】50870 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction	1	
Statistics and hypothesis testing	2	
Statistical process control	2	
Multivariate analysis	2	
Multivariate statistical process control	2	
Design of experiments	2	
Analysis of variance	2	
Application of design of experiments	2	

【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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 (3rd ed.), Nelson Thornes, 2005 (ISBN 978 -0748775163)

A. R. West, Basic Solid State Chemistry (2nd ed.), Wiley, 1999 (ISBN 978-0471987567)

【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】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】

【Lecture Form(s)】 【Language】 【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 an instructor of native speaker.

【Textbook】The class instructor will arrange its contents.

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】- Applicants should attend the guidance.
- Limited number (10-15) of registrants are allowed in each class.
- No cancellation is admitted once the class starts.

51251

English for Engineering Science

物理工学英語

【Code】51251 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【Instructor】James L. de Witt

【Course Description】The instructor will provide guidance on supplementary materials for each topic. Students will be expected to prepare materials for discussion related to the topic each week.

【Grading】Attendance, preparedness, and daily participation will be considered in grade determination. A daily in-class grade based on 0, 1, 2, or 3 points will be given as follows: 0-absent 1-not participating and/or not prepared 2-normal, expected level of participation and preparedness 3-extra participation and preparedness One in-class grade point will be subtracted for tardiness, speaking Japanese in class, breaking basic rules, etc. for each day of incidence. Demerits: Each 30 minutes of absenteeism will count as 1 demerit. A total of 16 demerits (absent from > 30% of in-class time) will be cause for failure.

【Course Goals】Emphasis will be on developing skills for oral communication with other scientists and engineers, as well as with laymen. Topics will be discussed at both levels, to develop dual awareness of the importance of speaking in accurate technical terms with logical organization for peers, and in simple but clear terms for laymen.

【Course Topics】

Theme	Class number of times	Description
English for Engineering Science	15	The instructor will provide guidance on supplementary materials for each topic. Students will be expected to prepare materials for discussion related to the topic each week. Students will be encouraged to actively participate in discussions of weekly topics, primarily in small groups or pairs, but also singly to the class, and in light debate. Ample opportunity for practice in description, argumentation, asking questions, and other aspects of discussion will be provided. Students will develop vocabulary naturally through preparation and discussion, with guidance from the instructor.

【Textbook】You can download a weekly plan of "English for Engineering Science" (http://www.mtl.kyoto-u.ac.jp/guidance/Syllabus-Kyodai-Phys-Eng-Spring-12.pdf).

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】http://www.mtl.kyoto-u.ac.jp/guidance/Syllabus-Kyodai-Phys-Eng-Spring-12.pdf

【Additional Information】There are two classes on Friday. The classes will give the same contents.

51252

English for Engineering Science

物理工学英語

【Code】51252 【Course Year】4th year 【Term】1st 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

【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】1st 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】1st term 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】 【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】1st term 【Class day & Period】 【Location】 【Credits】1

【Restriction】 【Lecture Form(s)】 【Language】 【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】1st term 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】 【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】2nd term 【Class day & Period】 【Location】 【Credits】1

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	3	
	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】2nd term 【Class day & Period】 【Location】 【Credits】1

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【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】2nd term 【Class day & Period】 【Location】 【Credits】1

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】 【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】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	5	
	4	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Plasma Physics

プラズマ物理学

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

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

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

51160

Radiochemistry

放射化学

【Code】51160 【Course Year】3rd year 【Term】2nd 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
	3	
	3	
	4	
	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】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Osamu Tabata, Hidetoshi Kotera, 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	

【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】 【Instructor】, , ,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51320

Introduction to the finite element method and its exercise

有限要素法の基礎と演習

【Code】51320 【Course Year】4th year 【Term】 【Class day & Period】 【Location】(undecided)

【Credits】1 【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1	
	1	
	3	
	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】2nd 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
	1.0	
	1.0	
	2.0	
	4.0	
	5.0	
	1.0	
	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】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	2	
	4	
	5	

【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】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

51431

Fluid Dynamics 2

流体力学２

【Code】51431 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】 【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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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】2nd 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

【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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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	2	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	2	Band gap, electrons and holes, Homogeneous semiconductor, doping
Junction theory	2	p-n junctions, metal-semiconductor junction, hetero-junction
Final examination and report	1	Evaluation will be given by the contents of the reports and quizzes of the subjects leaned in this course.

【Textbook】

【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】2nd 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
	1~2	
	4	
	2~3	
	2~3	
	4	
	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】2nd 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
	1~2	
	4	
	2~3	
	2~3	
	4	
	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】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】examination

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction	2	
Fundamental framework of quantum theory	3	
Quantization	2	
Particle motion in one dimension	3	
Harmonic oscillator	1	
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】1st 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
	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】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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	1	
Perturbation theory (stationary method)	3	
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】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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】A textbook is delivered at the lecture room

【Textbook(supplemental)】

【Prerequisite(s)】N/A

【Web Sites】http://cms.mtl.kyoto-u.ac.jp/tanaka.html

Password to access the lecture slides is shown at the lecture.

【Additional Information】

51660

Electronic Structures of Inorganic Materials 2

量子無機材料学２

【Code】51660 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】Fumiyasu Oba

【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	3	The characteristics and physical meanings of wavefunctions, total energy, and one-electron energy.
Theory, approximations, and methods in quantum chemistry (1)	4	Hartree and Hartree-Fock approximations in quantum chemistry.
Theory, approximations, and methods in quantum chemistry (2)	2	Density functional theory and perturbation theory.
Electronic structure of atoms	1	The wavefunctions and eigenvalues of atoms, Pauli principle, and Hund's rule.
Electronic structure and chemical bonding of molecules	1	The electronic structure and chemical bonding of molecules.
Electronic structure and chemical bonding of solids	1	The electronic structure and chemical bonding of solids.
Electronic states of lattice defects	1	The electronic states of point defects, surfaces, and interfaces, and their related material functions.
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】1st 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
	1	
	1	
	2	
	2	
	3	
	3	
	2	
	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】2nd 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
	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】1st 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
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22020

Exercise in English of Science and Technology(in English)

科学技術英語演習

【Code】22020 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

【Lecture Form(s)】 【Language】 【Instructor】Nishi etc.

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Guidance	1	Orientation of the course.
Net Academy Lessons	2-5	
Speaking Test	6	
Discussion Classes	7-14	
Achievement Test	15	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22110

Engineering and Ecology(in English)

工学とエコロジー (英語)

【Code】22110 【Course Year】 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】

【Course Description】The purpose of this course is to teach global ecological and environmental topics from an engineer viewpoint. The course especially contains such global ecological and environmental topics where engineering can provide solutions for sustainability. 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 to19 o ' clock.

The course is aimed for both Japanese and Foreign nationals.

The course starts on April 8th, 2014.

【Grading】Test, reports, laboratory performance.

【Course Goals】This course will provide tasks for engineering students to become aware of the relationships between engineering and various aspects of environmental issues. Students will also learn how to apply engineering skills to various environmental and ecological issues. The course prepares the students to be able to write engineering related ecological and environmental topics in English as well as verbally express themselves of these subjects.

【Course Topics】

Theme	Class number of times	Description
Student orientation, and Basic issues and critical thinking about the environment	1	
Environment and human population, ecosystems and communities	2	
Succession and restoration	3	
Biogeography	4	
Productivity and energy flow	5	
World food supply	6	
Effects of agriculture	7	
Basics of energy, fossil fuels	8	
Alternative - and nuclear energies and environment	9	
Water supply and use	10	
Water management, pollution and treatment	11	
Air pollution, Environmental economics	12	
Waste management, environmental planning	13	
Final test	14	

【Textbook】Botkin, Keller; Environmental Science, 8th Ed. 2012.

【Textbook(supplemental)】None

【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.

22210

Engineering and Economy(in English)

工学と経済（英語）

【Code】22210 【Course Year】 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】

【Language】English 【Instructor】

【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 October 2nd.

【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	
Cost concept	2	
Design economics	3	
Cost estimation techniques I	4	
Cost estimation techniques II	5	
The time value of money I	6	
The time value of money II	7	
The time value of money III	8	
Evaluation of a single project I	9	
Evaluation of a single project II	10	
Comparison and selection among alternatives I	11	
Comparison and selection among alternatives II	12	
Income taxes and depreciation	13	
Final test	14	

【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】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【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】 【Term】 【Class day & Period】 【Location】 【Credits】1 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

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・ 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 2014.4