SYLLABUS *2015*

[D] Electrical and Electronic Engineering

Kyoto University, Faculty of Engineering

[D] Electrical and Electronic Engineering

Electrical and Electronic Engineering

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60740

Introduction to Electrical and Electronic Engineering

電気電子工学概論

【Code】60740 【Course Year】1st year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】【Lecture Form(s)】 【Language】Japanese 【Instructor】All,

【Course Description】By understanding the activities conducted in the laboratories that belong to the Electrical and Electronic Engineering Course, the students learn what is the electrical and electronic engineering. Except a few times in the beginning of this course, the students will investigate the activities in the lab and have a presentation of their investigations. The students are expected to deeply understand the activities by actively investigating them by themselves and by explaining the results to other students. The students are also expected to make acquaintance with teachers and senior students (in the final year, and in master or PhD course) in the lab, and to recognize that it is essential to understand the contents lectured in the basic courses that they will learn in the first and second year, thorough the investigation of the lab and special lectures. The class will be usually conducted every two weeks and continue for two lecture-units in each lecture day. The class number of times in the table below shows the number of the lecture days.

【Grading】The grading is conducted by evaluation of various points, including the attendances at the lectures, the visit to the laboratories, and the presentation; the scores of the report; the score of the presentation.

【Course Goals】The goal of this lecture is that the students view how he or she will develop the field of the electric and electronic engineering and simultaneously how they develop their faculties in the field. For this purpose, the students will make teams, and each team will investigate the activity of a laboratory that belong to the Electric and Electronic Engineering Course. The teams cover all of the labs, and the students will share the results of their investigations through the presentation. Then, they will acquire an overview of the field of the electric and electronic engineering.

【Course Topics】

Theme	Class number of times	Description
Overview	2	A overview of the education that will be provided in the Electric and Electronic Engineering Course is lectured. After an introduction of how to proceed this course, the teams for investigation of each laboratory are announced.
Visiting of laboratories	2	Each team visits the assigned laboratory that belongs to the Electric and Electronic Engineering Course, and investigates the activities in the lab.
Preparation of presentation	2	The students prepare a poster presentation to introduce the activities in the laboratory that they visit and investigate.
Presentation	1	Each team performs a poster presentation. The students learn the activities in the laboratories that belong to the Electric and Electronic Engineering Course from the poster presentations of the other teams.

【Textbook】The materials will be distributed.

【Textbook(supplemental)】

【Prerequisite(s)】

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【Web Sites】

【Additional Information】There is a possibility that some parts of the lectures would be removed or some new lectures would be additionally included, according to the total class number of times.

60630

Fundamentals of Circuit Theory

電気回路基礎論

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

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

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

【Grading】Reports and examinations

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

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60030

Electric and Electronic Circuits

電気電子回路

【Code】60030 【Course Year】1st year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Basic Three Phase Circuits	2	
Passive Circuit Analysis	4	
Circuit Equations	2	
Active Circuit Analysis	3	
Frequency Characteristics of Electronic Circuits	2	
Basic Semiconductor Devices and Switching	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

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【Web Sites】

【Additional Information】

60100

Electronic Circuits

電子回路

【Code】60100 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Kazuhiko Sugiyama

【Course Description】Following the lecture of fundamentals of active device circuits in the course "Electric and Electronic Circuits", modeling of active devises, fundamentals of transistor circuits, various amplifier circuits, negative feedback in circuits, operational amplifiers, and oscillators are lectured. Nonlinear circuits, power supplies, and noise would be included in the course, when the lecture time remains.

【Grading】Examination and reports. More details are opened in the URL of this lecture.

【Course Goals】The goal of this course is to acquire the fundamentals of electronic circuits. Starting with understanding of a fundamental concept of electronic circuits i.e., modeling of active devices, the lecture based on the fundamental concept proceeds step by step to understand electric circuits. In this style, the lecturer wants to give the students an ability to understand the principles of more complicated circuits by application of deep understanding the fundamentals. The main targets to be understood are the circuits with bipolar transistors and operational amplifiers, as well as the fundamental concepts.

【Course Topics】

Theme	Class number of times	Description
Modeling of active devices	3	The essential concepts in the electronic circuit are lectured in order to treat active devices in the electric circuit theory. The concepts are the controlled source and the linearization. The decoupling between the bias and the signal, another important concept, is lectured.
Fundamentals of transistor circuits	3	The characteristics of the basic bipolar-transistor circuits of three different common references are lectured based on the operation principle of the bipolar transistor. The biasing circuits are lectured with somewhat practical circuits.
Various amplifier circuits	3	Several power amplifier circuits are lectured as we focus on their power efficiencies. DC amplifier circuits are lectured as we bear in mind that they are applied in operational amplifiers.
Operational amplifiers	2	The concept and advantages of the negative feedback circuit are lectured, and an important concept in the operational amplifier, the virtual short, is explained. The linear operational circuits such as integrator and differential circuits, and nonlinear operational circuits such as logarithmic and exponential amplifiers are introduced.
Oscilators	2	The principle of the oscillator circuit is lectured as a concept of the positive feedback. Various oscillator circuits are introduced with their characteristics.
Others	1	If we have a more lecture time, nonlinear circuits of multiplier and modulation/demodulation circuits, power supplies for electronic circuits, and the noise in electronic circuits will be lectured.
Examination	1	We make an examination in order to investigate the achievement in the lecture. We will offer an additional chance for discussion to the students who do not achieve satisfactorily.

【Textbook】M. Kitano, Fundamentals of Electronic Circuits (Reimei Publishing, Kyoto, 2008)

【Textbook(supplemental)】In addition to Japanese books, Tietze and Schenk: Electronic Circuits (Splinger) ;
Hayes and Horowitz: Student Manual for the Art of Electronics (Cambridge)

【Prerequisite(s)】"Electric and Electronic Circuit (60030)" and "Fundamentals of Circuit Theory (60630)". (The lecturer recommends moderate understanding of fundamentals of electric circuit as the minimum prerequisites in order to achieve this course.)

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【Web Sites】Link to the homepage of this course is here; (https://panda.ecs.kyoto-u.ac.jp/portal/site/2014-110-6010-000) Sorry for Japanese version only.

【Additional Information】The topics will be selected owing to limit of lecture time. The students should prepare "Bar Cover (http://www.kuee.kyoto-u.ac.jp/barcover/)" by themselves, used as a title page of each report. The homepage of this course is located in PandA (https://panda.ecs.kyoto-u.ac.jp/portal/). Contact the instructor after the lecture, when the students have any questions.

60750

Electrical and Electronic Engineering Practice A

電気電子工学実験A

【Code】60750 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1-2	
	3-4	
	3	
	6	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

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【Web Sites】

【Additional Information】

60760

Electrical and Electronic Engineering Practice B

電気電子工学実験Ｂ

【Code】60760 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	4	
	4	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

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【Web Sites】

【Additional Information】

60620

Exercise of Computer Programming in Electrical and Electronic Engineering

電気電子プログラミング及演習

【Code】60620 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Takashi Mastuyama, Sadao Kurohashi, Megumi Nakao, Shohei Nobuhara,

【Course Description】This course is aimed at learning programming in C, one of the most popular procedural programming languages in practice. The topics include: fundamental concept of programming, various data structures and control flows, practical skills on using compilers and debuggers.

【Grading】(1) weekly reports, (2) a final project, and (3) an interview on the final project.

【Course Goals】To understand the fundamental concept of programming, data structures, and control flows as well as to learn practical skills on using compilers and debuggers.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Introduction of the importance and contributions of computer programming, followed by some instructions on weekly reports and a final project.
Prerequisites of Programming	3	Usages of C compilers and debuggers. Basic knowledge in C such as operators, data types and their representations inside the computer, control flows.
Basic Programming	4	Arrays, multi-dimensional arrays, functions, scopes, bit-operations, recursive calls.
Advanced Programming	3	Strings in C and their representations inside the computer, pointers, structures, file I/Os.
Final Project	4	A final project of this year.

【Textbook】Bohyoh Shibata: "Meikai C Gengo Nyuumon-hen (in Japanese)" (Softbank Creative)

【Textbook(supplemental)】Chinese version (9789862010426) and Korean version (9788991767447) of the textbook are available.

【Prerequisite(s)】"Information Processing Basics" and "Exercises in Information Processing Basics" (basic skills on using UNIX-like systems)

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【Web Sites】PandA: https://panda.ecs.kyoto-u.ac.jp

【Additional Information】You can use your own laptop PC (Windows, Mac, Linux) for weekly reports and the final project. Please bring your laptop PC at the 1st week of the course. TAs will help you to setup programming environment and wifi connection.

Plus, please consider installing Cygwin environment by following the instruction at http://www.bme.sys.i.kyoto-u.ac.jp/~meg/lecture/laptop_setting.pdf (id: member, pass: cpro) before the 1st week of the course by yourself. This will make the setup process in the 1st week much quicker.

61020

Mathematics for Electrical and Electronic Engineering 1

電気電子数学 1

【Code】61020 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】English
【Instructor】Yoshiharu Omura and Shinji Doi,
【Course Description】We study properties of eigenfunctions, such as trigonometric functions, Bessel functions, Legendre functions as solutions of linear differential equations, which appear in various subjects of electric and electronic engineering such as electromagnetics, plasma physics, and quantum mechanics. As applications of these eigenfunctions, we also study Fourier series, Fourier transform, and Laplace transform.
【Grading】The grade will be evaluated based on reports (5points x 13times) and a term examination(100points). If the total points exceed 100 points, the grade is given as 100 points.
【Course Goals】We learn mathematical methods to describe spatial and temporal evolutions of various physical phenomena.
【Course Topics】

Theme	Class number of times	Description
Classification of Partial Differential Equations	2	Partial Differential Equations (PDE) : Laplace, Helmholtz, and diffusion equations; elliptic, hyperbolic, and parabolic types of 2nd order PDE.; derivation of Ordinary Differential Equations (ODE) from PDE by separation of variables
Ordinary Differential Equations	2	Series solutions by Frobenius' method; trigonometric, Bessel, and Legendre functions. Singular points for ODE; Wronskian; linear indepedence of solutions; second solution
Sturn-Liouville Theory	1	Self-ajoint ODE; Hermitian operator; Sturm-Liouville theory
Green's Function Method	1	Green's function method to solve nonhomogeneous equations.
Bessel Functions	2	MATLAB Demonstration (vibrating membrane, EM wave radiation), generating function, Bessel series; application to frequency modulation. Hankel functions; 3D Helmholtz equation in spherical coordinates, spherical Bessel functions
Legendre Functions	1	Legendre functions; generating functions; boundary value problems; associated Legendre polynomials.
Fourier Series	1	Properties of Fourier Series, Gibbs Phenomenon
Fourier Transform	2	Fourier integral, Fourier transforms of Gausian and derivatives, Dirac delta function, Solutions of wave equation and diffusion equation
Laplace Transform	2	Laplace transform, inverse Laplace transform, initial value problems of ODE
Confirmatin of Understanding	1	The level of understanding on all topics covered by this lecture will be confirmed through questions and discussion.

【Textbook】Mathematical Methods for Physicists: A Comprehensive Guide, Seventh Edition, Arfken, Weber, and Harris (Kindle version is available.)
【Textbook(supplemental)】
【Prerequisite(s)】Calculus, Vector Analysis, Functions of Complex Variable, and English comprehension of the level of VOA Special English
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【Web Sites】
【Additional Information】Lectures are given in English.

60080

Electromagnetic Theory 1

電磁気学 1

【Code】60080 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2 〜 3	
	2 〜 3	
	5 〜 6	
	3 〜 4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

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【Web Sites】

【Additional Information】

60120

Logic Circuits

論理回路

【Code】60120 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】This lecture covers analysis and design of logic circuits that form a basis of digital circuits such as processors. First, Boolean algebra, logic function and its minimization are explained. Then, analysis and design of combinational and sequential circuits are covered. Finally, arithmetic circuits for binary numbers are discussed.

【Grading】The level of achievement toward the goal of this lecture will be examined by a regular exam.

【Course Goals】To obtain basic knowledge that enables the analysis and design of small-scale logic circuits both for combinational and sequential operations

【Course Topics】

Theme	Class number of times	Description
Basics of logic functions	2	Digital circuits and logic circus, number systems, Boolean algebra, logic functions, and logical expressions are covered.
Logic minimization	4	Methods for logic minimization using Boolean cubes and Karnaugh maps, Quine-McCluskey method, properties of logic functions are explained.
Combinational circuit	2	Logic gates, analysis and design of combinatorial circuits, representative combinational circuits are discussed.
Sequential circuit	5	Operation and expression of sequential circuits, organization and operation of flip-flops, analysis and design of sequential circuits, synchronous counters and registers are explained.
Arithmetic circuit	1	The effect of delay and hazard in logic circuits are explained. Methods for binary addition and subtraction, organization and operation of binary adders are discussed.
Confirmation of understanding	1	The level of understanding on this lecture will be confirmed.

【Textbook】Naofumi Takagi, Logic Circuits, Ohmsha.

【Textbook(supplemental)】Teruhiko Yamada, Theory of Logic Circuits, Morikita Publishing .
Keikichi Tamaru, Basics of Logic Circuits, Kougaku-Tosho .

【Prerequisite(s)】

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【Web Sites】

【Additional Information】

60160

Computer Architecture Basics

計算機工学

【Code】60160 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Takashi Sato and Toru Ishihara

【Course Description】This course attempts to provide a foundation for students to understand modern computer architecture and to apply the insights and principles to understand operation of the computer systems.

【Grading】End-of-term exam (90%) and short quizzes (10%) are considered for the final grading.

【Course Goals】The primary goal is to help students understand how computer systems work. The course places a strong emphasis on the organization and operation of a basic pipelined microprocessor.

【Course Topics】

Theme	Class number of times	Description
Computer systems overview	2	
Number representation and binary arithmetics	4	
Machine language	2	
ALU and data path	2	
Control path and pipelining	4	
Course summary	1	

【Textbook】

【Textbook(supplemental)】David Patterson and John Hennessy, Computer Organization and Design: The Hardware/Software Interface (4th ed.)

【Prerequisite(s)】logic circuits (60120)

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【Web Sites】Materials are provided through KULASIS.

【Additional Information】

60130

Information Theory

情報理論

【Code】60130 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

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【Web Sites】

【Additional Information】

60150

Fundamentals of Electron Physics and Devices

物性・デバイス基礎論

【Code】60150 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Tsunenobu Kimoto, Jun Suda,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Quantum mechnics	4-5	
Statistics	3-4	
Solid state physics	2-3	
Electrons in solids	3-4	
Summary	1	

【Textbook】Tanaka Tetsuro: Busseikougaku no kiso (Asakura Shoten)

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60401

Semiconductor Engineering

半導体工学

【Code】60401 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Tsunenobu Kimoto, Jun Suda,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Introduction to semiconductor engineering	1	
Semiconductor physics	4-5	Band structure, carrier statistics, intrinsic/n-type/p-type, current transport (drift, diffusion), mobility, conductivity/resistivity, majority/minority carrier, Hall effect, optical properties, photoconductivity, photovoltaics, high-field effect
Theory of pn junctions	3-4	metal/semiconductor interface, ohmic and Schottky contacts, space charge, current-voltage characteristics, capacitance-voltage characteristics, generation/recombination, pn junction
Transistors	4-5	bipolar transistors, MOSFETs
Summary	1	

【Textbook】Hiroyuki Matsunami: Handoutai kougaku (Shoukoudou)

【Textbook(supplemental)】WILEY S. M. Sze, Kwok K. NG ""Physics of Semiconductor Devices"" .

【Prerequisite(s)】

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【Web Sites】

【Additional Information】

61010

Electric and Electronic Measurement

電気電子計測

【Code】61010 【Course Year】2nd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Graduate School of Engineering, Professor, Shigeki Takeuchi

【Course Description】The basics of the measurement of electrical and magnetic quantities will be explained. First we describe the general theory of the measurement, to explain the principles of the various measurement methods and measuring instrument on the amount of electricity. In addition, as electrical and electronic application measurement, optical measurement will be overviewed.

【Grading】The result of the final test, the results of tests at each lecture, and some reports will be taken into account for the total evaluation.

【Course Goals】Understand the basics of the electrical and electronic measurements.

【Course Topics】

Theme	Class number of times	Description
Standards and traceability	2	The general theory of the measurement, the unit system, outlined of measurement standards and traceability.
Error and evaluation of the measurement data	2 ～ 3	The concept of error and uncertainty, as well as the basic evaluation method of measurement data such as regression analysis
Analog&digital signal processing	2 ～ 3	Amplification circuit using an operational amplifier (OA), DA and AD conversion, and Fourier transform.
measurement technologies for electrical quantities	5 ～ 6	The most basic is to explain the principles of the instruction type electric instrument, described voltage, current, power, the electrical quantities of the measurement method of the power factor and the like. In addition, measures for small voltage measurement and noise, also mentioned for measurement of the frequency domain.
Applied electric electronic measurements	1 ～ 2	For example, optical measurements.
Confirmation of learning achievement	1	Confirmation of learning achievements on electric and electronic measurements.

【Textbook】Kohro Yamazaki, Denki-denshi-keisoku-no-kiso (The institute of electrical engineers of Japan)

【Textbook(supplemental)】

【Prerequisite(s)】Electromagnetism, electrical and electronic circuits, mechanics

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【Web Sites】

【Additional Information】Some topics may be skipped according to the progress of the lecture.

60770

Electrical and Electronic Engineering Advanced Practice A

電気電子工学実習A

【Code】60770 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60780

Electrical and Electronic Engineering Advanced Practice B

電気電子工学実習Ｂ

【Code】60780 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Instructor】Gotoh, Kimura, Ishii, Oida, Norimatsu, Sugiyama, Sato, Harada, Ebihara, Matsushima, Mifune, Hosoe, Ishihara, Tsuchiya, Fujita, Takaoka, and Suda,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	3	
	3	
	3	
	6	
	6	
	6	
	6	
	3-	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60800

Computational Methods and Exercise in Electrical and Electronic Engineering

電気電子計算工学及演習

【Code】60800 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】3

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

【Course Description】This course introduces the students the fundamentals of numerical analysis required for electrical and electronic engineering. In addition, the course offers exercises to develop the skills in computer programming to solve the related problems.

【Grading】Grading will be made based on reports, interview, attendance to the class, and several quizzes.

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Numerical expression and errors in computer	1 ～ 2	
Solution of linear equation	2 ～ 3	
Solution of nonlinear equation	2 ～ 3	
Solution of eigenvalue problem	1~2	
Interpolation and numerical Integration	2 ～ 3	
Solution of ordinal differential equation	2 ～ 3	
Solution of partial differential equation	2 ～ 3	
Interview	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

90302

Graph Theory
グラフ理論

【Code】90302 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】We learn basic theories of graphs and their applications, and fundamental algorithms for solving graph problems.

【Grading】Mainly evaluated by the final exam. Exercises and discussions in class may be considered.

【Course Goals】The goal of this course is to learn basic theories of graphs and their applications, and fundamental algorithms for solving graph problems.

【Course Topics】

Theme	Class number of times	Description
Graphs and algorithm	3	I explain definition of graphs and basic properties of graphs. I also briefly review the basics of algorithms and their complexity.
Minimum spanning trees	2	Kruskal's algorithm, Prim's algorithm, Steiner tree problem.
Shortest path problems	1	Dijkstra's algorithm
Hamilton circuit problem	2	Hamilton cycle, Euler cycle, Dirac's theorem.
Coloring problems	2	Vertex coloring, edge coloring.
Maximum flow problems	2	Ford-Fulkerson's algorithm.
Matching	2	Hall's theorem, Hungarian method.
Exam	1	

【Textbook】No specification.

【Textbook(supplemental)】I show some recommended books in class.

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60220

Electric Circuits

電気回路

【Code】60220 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】The course introduces the fundamentals of transmission line which is essensial for high-frequency circuit design. Topics covered include: circuit model of transmission line; telegraph equation, transient and steady states in transmission line, analysis with Laplace transform.

【Grading】Reports and examination

【Course Goals】Students are expected to learn the transient and steady states of the circuit with transmission line.

【Course Topics】

Theme	Class number of times	Description
Distributed and lumped circuit	1	We introduce transmission line.
Transient analysis	5	We introduce the circuit model of transmission line and derive telegraph equation. Transient analysis in transmission line is explained.
AC analysis	3	Steady state analysis in transmissionline.
Transient analysis of lumped circuit	3	Transient analysis with Laplace transform
synthesis of circuit	2	Synthesis of circuit by network functions.
academic achievement test	1	The level of understanding on this lecture will be confirmed.

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60090

Electromagnetic Theory 2

電磁気学 2

【Code】60090 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

61050

Electric Machinery Fundamenntals

電気機器基礎論

【Code】61050 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】Fundamental theory of electro-magnetic energy conversion, fundamental configuration and characteristics of transformer, induction rotating machine, synchronous rotating machine and direct current rotating machine are lectured.

【Grading】mini-exercises in class and regular exam

【Course Goals】Master the fundamentals of various types of electric machinery

【Course Topics】

Theme	Class number of times	Description
General Introduction	1-2	History of electro-magnetic energy conversion and electric machinery
Electro-magnetic energy conversion	3-4	fundamental theory of electro-magnetic energy conversion
basic characteristics of electric machinery	8-9	basic characteristics and configuration, equivalent circuit of various types of electric machinery
general theory of rotating mahine	1	general expression of electric machinery for dynamic performance analysis
Evaluation of achievement	1	Exercise

【Textbook】Resume

【Textbook(supplemental)】Electric machinery (1),(2) Ed. Sakutaro Nonaka, Morikita Syuppan (in Japanese) ISBN 4627720106
Electric machinery (1),(2) Ed. Takao Okada, Ohm-Sya (in Japanese) ISBN 4274128970

【Prerequisite(s)】Electric Circuits, Electromagnetic Theory 1

【】

【Web Sites】

【Additional Information】Office hour : Monday 12:00-13:00

61030

Mathematics for Electrical and Electronic Engineering 2

電気電子数学２

【Code】61030 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60600

Digital Circuits

ディジタル回路

【Code】60600 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】,

【Course Description】This lecture covers basics of digital circuits. First, fundamental properties of digital signals such as frequency characteristics, transmission and shaping of digital signals will be explained. Next, switching operation of semiconductor devices such as diodes, bipolar transistors and MOS transistors will be examined. Finally, circuit structure and performance of logic gates and memories for digital integrated circuits will be discussed.

【Grading】The level of achievement toward the goal of this lecture will be examined by a regular exam.

【Course Goals】To understand basic properties of digital signals and linearized circuits. To understand operating principles, circuit performance, and design method of logic gates and memories.

【Course Topics】

Theme	Class number of times	Description
Basic properties of digital signals	2	Frequency spectrum of digital signals and step response of linearized circuit will be explained.
Transmission of digital signals	2	Signal transfer characteristics of loss-less transmission lines will be explained. Lossy transmission lines will also be covered.
Switching characteristics of semiconductor devices	3	DC and transient characteristics of pn junction diodes, bipolar transistors, MOS transistors will be explained.
Waveform shaping of digital signals	1	Waveform shaping circuits such as a clipper, limiter, and Schmitt-trigger circuits will be explained.
Bipolar digital circuits	2	Basic logic gates using bipolar transistors are explained. First, DC and transient characteristics of an bipolar inverter circuit will be analyzed. Next, circuit configuration, operating principle and circuit performance of an ECL gate will be discussed.
MOS digital circuits	3	Basic logic gates using MOS transistors are explained. Circuit configuration, operating principle and circuit performance of a complementary logic gate, a complex logic gate, and a dynamic logic gate will be discussed.
MOS memory circuits	1	Circuit configuration of ROM and RAM will be explained.
Confirmation of understanding	1	The level of understanding on this lecture will be confirmed.

【Textbook】Hand-outs will be provided.

【Textbook(supplemental)】

【Prerequisite(s)】Semiconductor Engineering, Logic Circuits, Electronic Circuits

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【Web Sites】

【Additional Information】

60260

Control Engineering

自動制御工学

【Code】60260 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】T. Hagiwara, E. Furutani,

【Course Description】This course covers a basic theory of feedback control for linear continuous-time systems in the frequency domain. The fundamentals of control systems are lectured on through such concepts as the Laplace transformation, transfer functions, block diagrams, transient responses, frequency responses, and stability criteria. The course proceeds in parallel to the contents of Chapters 1 through 4 and the former half of Chapter 5 of the textbook. The stress of the lecture, however, is placed on the theoretical framework, the basic concepts, and their interrelations. Hence some topics are left to the spontaneous studies of the class members, who are also supposed to work on assignments to have better understanding.

【Grading】The assignments are only for motivating review; the grading will be based on the exam.

【Course Goals】To understand the basic treatment of linear feedback systems in the frequency domain, particularly the Laplace transformation and its role, the transient responses, stability and performance evaluation of feedback systems, frequency responses, as well as their relations.

【Course Topics】

Theme	Class number of times	Description
Feedback systems and the Laplace transformation	4 ～ 5	Fundamental notions for feedback systems, history and roles of control technologies, the Laplace transformation as a key tool for dealing with feedback control systems, and transfer functions.
Block diagrams and feedback control systems	3 ～ 4	Block diagrams and their equivalent transformations, the performance of feedback control systems and its evaluation, basic properties of feedback control systems and their roles observed through the analysis of step responses of simple examples.
Transient responses and stability of systems	1 ～ 2	Transient responses of systems and algebraic stability criteria of feedback systems.
Frequency responses	4 ～ 5	Frequency responses and their representation such as the vector loci and the Bode diagrams, manipulations of Bode diagrams, the Nyquist stability criterion, and stability margins. Checking degrees of understanding of all the lecture topics, e.g., through comments on the exam, closes the class.

【Textbook】荒木光彦：古典制御理論 [基礎編] (培風館)

【Textbook(supplemental)】

【Prerequisite(s)】Theory of functions in complex variables, as well as basic understanding about complex numbers.

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【Web Sites】(from within the university) http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/AC/

【Additional Information】The contents of the lecture and their order are subject to changes depending on the situation each year.

60270

Digital Control

ディジタル制御

【Code】60270 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】T. Hagiwara, Y. Ebihara,

【Course Description】This course covers a basic theory of digital control systems, based on the understanding on "Control Engineering." The treatment of discrete-time signals and linear discrete-time systems in the frequency domain is first introduced through the z-transformation and pulse transfer functions. Digital compensators as well as their programs and frequency responses, the stability and steady-state errors of closed-loop feedback systems, sampling period selection and anti-aliasing filters are then lectured on. The class members are supposed to understand the fundamental treatment of digital control systems through such concepts, who are also supposed to work on assignments about computational techniques to have better understanding.

【Grading】The assignments are only for motivating review; the grading will be based on the exam.

【Course Goals】To understand the basic treatment of digital control systems including their components and the associated difficulties and measures, particularly the z-transformation and its role, the discretization of controlled objects, the similarity to and differences from the analysis of continuous-time control systems, as well as aliasing.

【Course Topics】

Theme	Class number of times	Description
Fundamentals of digital control and the z-transformation	4 〜 5	The fundamental structure of digital control systems and the associated issues, the z-transformation as a key tool for dealing with digital control systems, the frequency-domain interpretation of samplers, and aliasing.
Pulse transfer functions, frequency response, and digital compensators	4 〜 5	Basic components such as hold circuits and pulse transfer functions, discretization of controlled objects, the pulse transfer functions and programs of digital compensators, transient responses of discrete-time systems, stability and frequency responses, and basic digital compensators.
Closed-loop digital control systems	5 〜 6	Analysis of digital control systems with pulse transfer functions through the discretization of the controlled object and disturbances, the stability, stability criteria and steady-state errors of closed-loop systems, basic standpoint for the disturbance rejection in digital control systems, sampling period selection and anti-aliasing filters. Checking degrees of understanding of all the lecture topics, e.g., through comments on the exam, closes the class.

【Textbook】荒木光彦：ディジタル制御理論入門 (朝倉書店)

【Textbook(supplemental)】

【Prerequisite(s)】"Control Engineering", "Exercise of Computer Programming in Electrical and Electronic Engineering" (basic understanding about programming)

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【Web Sites】(from within the university) http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/DC/

【Additional Information】The contents of the lecture and their order are subject to changes depending on the situation each year.

60660

System Optimization

システム最適化

【Code】60660 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】The course deals with mathematical methods of system optimization for linear programming and nonlinear programming problems. It covers such topics as the formulation of optimization problem, solution and analysis methods of linear programming problems, optimality conditions and solution methods of nonlinear programming problems.

【Grading】The assignments are only for understanding; the rating will be based on an exam.

【Course Goals】To understand fundamentals of linear programming and nonlinear programming: the simplex method, duality, locally and globally optimal solution, convex space and convex functions, optimality conditions for nonlinear programming problems, and basic solution methods.

【Course Topics】

Theme	Class number of times	Description
Optimization problems	1	optimality, overview and classification of optimization problems, mathematical preliminary
Linear programming and simplex method	7-8	definition of linear programming problems, standard form, simplex method and simplex tableau, duality, dual problems, duality theorem, dual simplex method, and sensitivity analysis
Nonlinear programming problems	1	definition of nonlinear programming problems, locally optimal solution and globally optimal solution, convex space and convex function, mathematical preliminary
Solution methods for nonlinear programming problems without constraints	2-3	optimality conditions for nonlinear programming problems without constraints, steepest descent method, conjugate gradient method, Newton method, and quasi-Newton method
Solution methods for nonlinear programming problems with constraints	3-4	optimality conditions for nonlinear programming problems with constraints, Lagrange function, duality, saddle point theorem, penalty function method, multiplier method, and sequential quadratic programming method

【Textbook】H. Tamaki (ed.): System Optimization (in Japanese), Ohm-sha, 2005 .

【Textbook(supplemental)】M. Fukushima: Introduction to Mathematical Programming (in Japanese), Asakura, 1996 .

【Prerequisite(s)】linear algebra and analytics

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【Web Sites】http://turbine.kuee.kyoto-u.ac.jp/~furutani/system-optimization/

【Additional Information】The contents of the lecture and their order are subject to changes depending on the situation each year.

61060

Applied Electric Machinery

応用電気機器

【Code】61060 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Taketsune Nakamura,

【Course Description】This lecture will explain principles and concepts of electric machineries used in the fields of our living and industrial applications. Especially, detailed explanation will be made for variable speed control of the rotating machines and re-generation method. Recent trends for the developments of the electric machineries such as ones for the electric vehicle and the wind turbine are also to be outlined.

【Grading】Evaluated by means of the examination. Imposed drills at the lecture and reports may also be considered for the evaluation.

【Course Goals】Understand fundamentals of designs, kinetic characteristics, coordinate transform as well as concept of variable speed control and drive-control method of rotating machineries. Also, understand basic concepts on recent trends of the developments.

【Course Topics】

Theme	Class number of times	Description
Concept of output power and fundamental aspects of design in electric machineries	2-3	Discuss the relationship among output power, rotating speed, pole number, electric loading and magnetic loading in electric machineries. Also, concept of temporal rating and that of object oriented design are also to be explained.
load characteristics and kinetic characteristics	1-2	Discuss the load characteristics, kinetic characteristics, etc. of the rotating machineries are explained. Examples of visulalized simulation results may also be shown for the aid of easier understanding.
Principle of variable speed control of rotating machineries	6-8	Based upon concrete examples, necessity for the variable speed control of the rotating machineries is discussed. And then, fundamental equations of respective rotating machines, method of coordinate transform for the expression of dynamic characteristics are explained. Further, basic concept and fundamental principle of the variable speed control is described.
Power conversion for drive of rotating machines	1-2	Power conversion method for the realization of variable speed control is explained.
Permanent magnet rotating machines	1	Permanent magnet rorating machine, which is one of the most major motors, is explained from the point of view of its rotating principle as well as characteristics.
Trends of new electric machineries	1	Trends of developments of new rotating machineries, e.g., electric (hybrid) automobile, linear motor, wind turbine, etc., are outlined. Also, concept and meaning of re-generation is explained.
Summary	1	The classes are summarized. This is the feedback to students according to their score.

【Textbook】Tokai Kim, "Modern electric machinery" Denki-gakkai

【Textbook(supplemental)】Takao Okada et al., "Electric machinery (2)"(second edition) Ohmsha ,
Sakutarou Nonaka, "Electric machinery (1), (2)" Morikita-shuppan

【Prerequisite(s)】Electric Circuits, Electromagnetic Theory, Power Electronics, Control Theory

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【Web Sites】

【Additional Information】Documents will be distributed if necessary.

60720

Power Electronics

パワーエレクトロニクス

【Code】60720 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】Power Electronics is a filed of power conversion and system control through applications of power semiconductor devices. In class, fundamental lectures include the basic of poser conversion by switching circuit and circuit behavior in transient. The applications include the control methods of power sources and motors by conversion circuits.

【Grading】The final evaluation is decided based on examination (70%) and homework (30%).

【Course Goals】Students are expected to learn the method of power conversion and its applications based on circuit theory, switching circuit, and semiconductor engineering. They are also requested to understand the method for achieving the functions of actuators through the control of electric power convertor.

【Course Topics】

Theme	Class number of times	Description
Outline of power electronics	4	Introduction of power electronics. Fundamental topics of LRC circuit based on stored energy and power and switching circuit are lectured . The lecture will be interconnected with semiconductor engineering.
dc/dc convertors	4	The dynamic behavior and characteristics of Buck and Boost converters are explained.
ac/dc convertors	4	Various conversion circuits are explained. Configurations of single phase and three phase circuits are lectured with the analysis of harmonic components of output.
allications of power electrinics	2	As the applications of power electronics, the motor drive by inverters are lectured.
Summary	1	The classes are summarized. This is the feedback to students according to their score.

【Textbook】Lecture notes will be posted at the web page.

【Textbook(supplemental)】There are many supplemental texts. If students request their English version, please contact to the professor.

【Prerequisite(s)】Electric circuit, Electronic circuit, Power circuit, and Electric apparatus.

【】

【Web Sites】Lecture data are offered on kulasis.
https://www.k.kyoto-u.ac.jp/student/

【Additional Information】Students are recommended to download the note from home page and study them before the classes. If you miss one of the mid and final exam, it becomes too hard to pass this class. Taking the follow-up lecture will be requested to the students who is difficult to pass the requested level.

61070

Electric Power Engineering 1

電力工学１

【Code】61070 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Yoshihiko Susuki and Shigeomi Takai

【Course Description】This course provides an introduction to power generation technologies for students of electrical and electronic engineering. This is the first course in power and energy engineering in the School of Electrical and Electronic Engineering. Topics include fundamentals of hydraulic, thermal, and nuclear power plants, fundamentals and current trends of renewable energy resources, and batteries.

【Grading】Final examination and homework.

【Course Goals】The goal of this course is to understand fundamentals of power generation technologies.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	
Hydraulic generation	3	
Thermal generation	3	
Nuclear generation	3	
Renewable energy	2	
Battery	2	
Sumary	1	

【Textbook】Yoshikawa, Kakimoto, and Yao, Power Generation Engineering (Denki-Gakkai) (in Japanese) ; Handouts

【Textbook(supplemental)】

【Prerequisite(s)】Basic circuit theory; Fundamental physics and chemistry

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【Web Sites】

【Additional Information】

60310

Electrical Discharge and Breakdown

放電工学

【Code】60310 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	4	
	3	
	6	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60320

Modulation Theory in Electrical Communication

通信基礎論

【Code】60320 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4-5	
	5-6	
	4-5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60330

Information Transmission

情報伝送工学

【Code】60330 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Eiichi Murata, Koji Yamamoto,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60340

Telecommunication Networks

通信ネットワーク

【Code】60340 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

61090

Radio Engineering

電波工学

【Code】61090 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Toru Sato and Naoki Shinohara

【Course Description】In this class we study basics of the radio wave and antennas. We first examine the nature of the electromagnetic wave based on the wave equation derived from the Maxwell's equations. We discuss the relation between the source current distribution and the radiated wave field in terms of various antenna parameters. We further study the wave propagation, such as refraction, reflection, scattering, and diffraction. We also derive the basics of guided wave transmission from the boundary conditions of the Maxwell's equations.

【Grading】Grading is based on the regular examination, but the rating of reports may be considered as well.

【Course Goals】Understand the basic theory of the radio wave, and technology for its industrial applications.

【Course Topics】

Theme	Class number of times	Description
Nature of the radio wave	2 ～ 3	We solve the Maxwell's equation in its simplest form to show that it gives the electromagnetic wave propagating in space. Basic nature of planar wave is examined including its reflection, transmission, velocity and polarization.
Radiation and basics of antennas	4 ～ 5	We derive the radiation field from the Maxwell's equation with sources, and study its characteristics in the near and far fields. We examine the radiation from short dipole and linear antennas in terms of important parameters such as the gain, impedance, frequency characteristics, and effective area. We also study principle, structure, and basic analysis methods of various realistic antennas such as array and aperture antennas.
Radio wave propagation	2 ～ 3	We study basic issues related to various types of the radio wave propagation including the ground wave, tropospheric and ionospheric propagation, and space communication. We also discuss diffraction and scattering of the radio waves.
Guided wave transmission	4 ～ 5	We first study basic ideas related to the guided wave transmission, such as the transmission line theory and the Smith chart. We then study individual elements including coaxial line, microstrip line, rectangular waveguide, and circular waveguide, mainly focusing on their propagation modes, transmission characteristics, and loss.

【Textbook】Hasebe, 'Denpa kogaku (radio engineering),' 2nd Ed., Corona publishing, 2005 .

【Textbook(supplemental)】Balanis, 'Antenna theory,' 2nd Ed., Wiley, 1997.

【Prerequisite(s)】Knowledge of Electromagnetic theory 2 is required. Modulation Theory in Electrical Communication is recommended.

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【Web Sites】

【Additional Information】

60370

Computer Software

計算機ソフトウェア

【Code】60370 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

61110

Embedded Computer Systems

組み込み計算機システム

【Code】61110 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Takashi Sato and Tohru Ishihara,

【Course Description】This lecture covers basics of embedded systems. Processor architectures, memory subsystems, I/O systems, and overall system architectures in embedded systems will be explained.

【Grading】The level of achievement toward the goal of this lecture will be examined by a regular exam.

【Course Goals】To understand basic structures of embedded computer systems. To understand impacts of architectural design choices on performance and energy consumption of embedded systems.

【Course Topics】

Theme	Class number of times	Description
Basic properties of computer systems	1	History of embedded computer systems will be overviewed.
Cache memory	3	Cache architectures, data transfer between main memory and cache will be explained.
Compiler optimization	1	A role of compilers in computer systems and performance tuning by code optimization will be explained.
Main memory virtualization	2	Relation between main memory and secondary memory, memory virtulization, and address conversion will be explained.
Interrupt and I/O systems	2	The concept of interrupt, interrupt handling, and necessary hardware supports for the interrupt will be explained. Relation between operating systems and the interrupt, and time overhead for the interrupt will be explained.
instruction pipeline	2	The concept of instruction pipelining, necessary mechanisms for the pipelining, and characteristics of RISC processors will be explained.
Instruction formats and addressing modes	2	Formats and addressing modes of typical instructions will be explained.
Latest embedded systems	1	Latest computer architectures such as a multi-core processor will be explained.
Confirmation of understanding	1	The level of understanding on this lecture will be confirmed.

【Textbook】

【Textbook(supplemental)】David Patterson and John Hennessy, Computer Organization and Design: The Hardware/Software Interface (4th ed.)

【Prerequisite(s)】logic circuits (60120), computer architecture basics (60160)

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【Web Sites】

【Additional Information】

60610

Digital Signal Processing

ディジタル信号処理

【Code】60610 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Takashi Matsuyama, Shohei Nobuhara

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60390

Solid-State Electronics

固体電子工学

【Code】60390 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Susumu Noda, Takashi Asano,

【Course Description】There are various devices which make use of electrons and photons in solid state (or materials). The examples are solar cells, semiconductor lasers, and transistors. These devices are indispensable for all areas of technologies, and thus regarded as brains in society. In this lecture, we explain various phenomena based on electrons and photons in solid states, where the focus is on the interaction between solid states and photons via electron transitions.

【Grading】Examination and submission of a few reports

【Course Goals】Understanding of fundamental of band structures in solid state and the related phenomena such as light absorption and amplification based on the electron transitions between valence and conduction bands.

【Course Topics】

Theme	Class number of times	Description
Overview of solid-state electronics	1	After the explanation of progress in electronics based on solid-state electronics, we show the contents of this lecture.
Fundamentals of solid-state electronics	1 ～ 2	First, we explain the method to derive band structure of solid state using Kronig-Penney model. Then, we describe various fundamental concepts in solid state, such as density of states, phonons, etc.
Photon absorption in solid state	4	We will explain the mechanism of photon absorption in solid state and derive some equations to expess the absorption quantitatively.
Amplification of light	2 ～ 3	We will explain the mechanism of optical amplification and derive some quantitative equations.
Various photonic devices	3 ～ 4	Various photonic devices based on the above discussions are given, such as solar cells, semiconductor lasers, etc.
Verification of understanding	1	We confirm whether the students can understand the above subjects.

【Textbook】Note stile

【Textbook(supplemental)】We will show some references during the lecture

【Prerequisite(s)】It is desirable to learn some related lectures such as semiconductors, fundamental of material and devices, etc.

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【Web Sites】

【Additional Information】The numbers and order of course topics described above might be changed.

60810

Quantum Theory for Electrical and Electronic Engineering

電気電子工学のための量子論

【Code】60810 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60410

Plasma Engineering

プラズマ工学

【Code】60410 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60420

Vacuum Electronic Engineering 1

真空電子工学 1

【Code】60420 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】Fundamentals on behavior of charged particle beams (electron and ion beams) in vacuum, and also fundamentals on control of charged particle beams are given; the lecture includes nature of electrons and ions, generation of electrons, electron optics, and interaction of charged particle beams with solids.

【Grading】Grading will be done with the result of the term-end examination.

【Course Goals】The goal of the course is to understand physical basis of the phenomena related to charged particle beams, through a study of generation of charged particles, behavior in electromagnetic fields, and interaction of charged particles with solids.

【Course Topics】

Theme	Class number of times	Description
General concepts of vacuum electronic engineering	1	Concepts of electron and ion beams are given, and the advantages of these beams in various engineering are described. Finally, current status of the application of charged particle beams are given.
Formation of electron beam	4	Concept of work function which is important for electron emission from solids, and some methods to extract electrons from solid to vacuum are described.
Transport and handling of charged particle beam	5	Electron optics (electrostatic lens, magnetic lens, acceleration and deceleration), which is important to control the shape and energy of charged particles is given. Energy analyzer and mass analyzer are also explained.
Interaction of charged particles with solids	5	Fundamentals on interaction between the charged particles and the gas or solid are described, and application of the interaction will be given.

【Textbook】Zyunzo Ishikawa: Science and Technology of Charged Particle Beams, CORONA PUBLISHING CO., LTD. (2001)

【Textbook(supplemental)】

【Prerequisite(s)】Knowledge on electromagnetics, mechanics, and solids are necessary.

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【Web Sites】

【Additional Information】Bring your calculator, because tiny exercise will be in the class.

60430

Electrical and Electronic Materials

電気電子材料学

【Code】60430 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60440

Fundamentals of Optical Engineering 1

光工学１

【Code】60440 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

61120

Basics of Biomedical Engineering

生体工学の基礎

【Code】61120 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Prof. Tetsuo Kobayashi and Prof. Shinji Doi

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Life system	2	
Electrophysiology & Neurophysiology	5	
Central nervous system	3	
Measurement and imaging methods	4	
Review	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

61140

Introduction of Mechatronics

メカトロニクス入門

【Code】61140 【Course Year】3rd year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	6	
	3	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60360

Microwave Engineering

マイクロ波工学

【Code】60360 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese
【Instructor】Naoki Shinohara, Tomohiko Mitani, Shigeo Kawasaki (JAXA),
【Course Description】Theory and applications of microwave transmittion line , microwave passive circuits, active circuits, and microwave tubes are given. Applications of thier devices and elements for mobile phones, radar and wireless power transmission are given.
【Grading】Grading will be done with the result of the final report and several reports in lectures.
【Course Goals】The course goal is to understand the principle of microwaves and microwave circuits and to understand the principle of mobile phones and the other microwave applications.
【Course Topics】

Theme	Class number of times	Description
General concepts	1 ～ 2	After confirmation of Maxwell's equations and wave guide theory, general concepts of microwave enginnering are presented as introduction of the following theme.
Circuit theory of transmission line	2 ～ 3	Characteristics of microwave transmission line and circuit theory of transmission line are given. Impedance matching and Smith Chart are given.
Microwave passive circuits	2 ～ 3	Connector, circuit device in waveguide, impedance matching load, attenuator, phase shifter, T-blanch, isolator, circuilator, directional coupler, power divider/combiner are given.
Microwave resonator and filter	2 ～ 3	Microwave resonator and filter are given.
Microwave tubes	1 ～ 2	Generation/amplifier mechanism of microwave tubes of Klystron, TWT, magnetron are given.
Micorwave active circuits and semiconductor devices	2 ～ 3	Diode as microwave passive semiconducotor and FET and HBT as microwave active semiconductors are given. Its applications like Parametric amplifier are given.
Microwave Applications	3 ～ 4	Theory, requirements, and typical components of RF circuits in mobile communication are given. The other applications of radar, microwave heating, and wireless power transmission are given.
Confirmation of Understanding	1	Student's understanding of this lecture is confirmed. Opportunity of feed-back lecture is given if the student's understanding is not enough.

【Textbook】Masamitsu Nakajima: Microwave Engineering (in Japanese) (Morikita Syuppan)
【Textbook(supplemental)】Toshio Nojima and Yasushi Yamao: RF Circuit Technologies for Mobile COmmunication (in Japanese)(IEICE)
Yoshihiro Konishi: Theory and Applications of Microwave Circuits (in Japanese) (Sogo Denshi Syuppan)
【Prerequisite(s)】"Radio Engineering", Maxwell's equations, theory of radio waves, electric circuits, Distributed parameter circuits
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【Web Sites】
【Additional Information】

60480

Optical Communications

光通信工学

【Code】60480 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60550

Vacuum Electronic Engineering 2

真空電子工学２

【Code】60550 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Gikan Takaoka, Yasuhito Gotoh,

【Course Description】Operational principles of electron and ion beam devices are given. First, microwave tubes which utilize the interaction between electron beam and electromagnetic wave are described. Next, Devices, processing systems, and aparatus for analysis which utilize interaction between electron beam and solids are described. Finally, those which utilize interaction between ion beam and solids are given.

【Grading】Grading will be done with the result of the term-end examination.

【Course Goals】The course goal is to understand the principle of electron/ion beam devices.

【Course Topics】

Theme	Class number of times	Description
General concepts of charged particle systems	1	Explanation on the nature of the charged particle beams is made, and then current status of the application of charged particle beams is presented.
Microwave tubes	5	After briefly giving the explanation of micro-vacuum tubes, operational principles of microwave tubes that utilize density modulation of electron beam; klystron, traveling wave tube, magnetron, gyrotron.
Operational principles of electron beam devices	4	After giving operational principles of electron beam devices, mechanisms of deposition, welding, curing, exposure, analysis with electron beams are presented.
Operational principles of ion beam devices	4	Operational principles of ion implantor, ion beam etching system, ion beam deposition system, and system for ion beam analysis are given.
Feedback	1	Answer the questions on the contents of the lecture and problems given at exam will be made.

【Textbook】Zyunzo Ishikawa, Science and Technology of Charged Particle Beams, CORONA PUBLISHING CO. LTD. (2001)

【Textbook(supplemental)】

【Prerequisite(s)】Vacuum Electronic Engineering 1

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【Web Sites】

【Additional Information】

60560

Optoelectronic Devices

光電子デバイス工学

【Code】60560 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4 〜 5	
	4 〜 5	
	4~5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60570

Fundamentals of Optical Engineering 2

光工学２

【Code】60570 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3-4	
	5-6	
	3-4	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60670

Intelligent Systems

知能型システム論

【Code】60670 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

61040

Electrical　Conduction in Condensed Matter

電気伝導

【Code】61040 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Toshiya Doi,Itsuhiro Kakeya,

【Course Description】A fundamental aspect of the electrical conduction in solids is discoursed in terms of physics based on the classical dynamics and later on the quantum physics. An important concept of the phonon and the electron-phonon is discoursed, which play a very important role in the electrical conduction in solids. The electrical conductivity is discoursed with a frequency from 0, that is dc, to optical frequency, by which a unified understanding of electrical conduction and the optical property is intended.

【Grading】Basically, an examination is imposed after the last class. A report may be imposed in case of necessity.

【Course Goals】This class in intended to bestow the understanding of the solid state physics of a level dealt in the celebrated textbook by Ashcroft and Mermin. It is also intended for those attending in this class to acquire an ability sufficient to strive through such a textbook by himself or herself after the class is completed.

【Course Topics】

Theme	Class number of times	Description
Lattice and reciprocal lattice	2	
Fundamentals of quantum mechanics and hydrogen atom model	2	
Free electron fermi gas	3	
Energy band	2	
Electron-phonon interaction and the electrical conduction in metals and semiconductors	2	
Superconductivity	3	
Feedback	1	

【Textbook】C. Kittel, Introduction to Solid State Physics, 8th ed., Wiley

【Textbook(supplemental)】"Solid State Physics" by Ashcroft and Mermin

【Prerequisite(s)】Those who would like to attend in this class are recommended to study electrodynamics, statistical physics, and introduction to the solid state devices in advance. The lecture is, however, given in Japanese.

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【Web Sites】

【Additional Information】

61080

Electric Power Engineering 2

電力工学２

【Code】61080 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Yasuyuki Shirai and Yoshihiko Susuki

【Course Description】Electric power system is a large-scale engineered system to supply electrical energy from generation facilities, through substations, transmission and distribution networks, to loads. This course provides an introduction to power systems engineering for students of electrical and electronic engineering. Topics include the system structure, interconnected systems, dc and ac transmissions, stability, frequency and voltage control, economic aspects of power system operation, and fault analysis.

【Grading】Final examination and homework.

【Course Goals】The goal of this course is to understand fundamentals of power systems engineering, including their operation, analysis, and control.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	
System structure and Per Unit (PU) system	1-2	
Stability	2-3	
Frequency control	2-3	
Voltage control	2	
Economic aspects	1-2	
Fault analysis	2	
Summary	1	

【Textbook】Ohsawa, Power Systems Engineering (Ohm-Sha) (in Japanese) ; and handouts.

【Textbook(supplemental)】

【Prerequisite(s)】Circuit Theory (60630, 60030, 60220); Electric Machinery Fundamentals (61050); Electric Power Engineering 1 (61070)

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【Web Sites】

【Additional Information】

61100

Antenna and Propagation Engineering

アンテナ・伝搬工学

【Code】61100 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Instructor】Mamoru Yamamoto,Hiroyuki Hashiguchi,Toru Sato,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

61130

Integraged Circuits Engineering

集積回路工学

【Code】61130 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Hidetoshi Onodera, Takashi Sato, Tohru Ishihara,

【Course Description】This lecture explains design methodologies for CMOS LSI circuits. Both analog and digital circuits will be covered.

【Grading】The level of achievement toward the goal of this lecture will be examined by the results of reports.

【Course Goals】To understand design flow of CMOS LSI circuits.

【Course Topics】

Theme	Class number of times	Description
CMOS process and devices	2	Overview of CMOS process technology related to LSI circuit design will be explained. Structures, characteristics and modeling methods for MOS transistors, capacitors, inductors and interconnects will be also explained.
Analog circuit design	2	Architecture and behavior of basic analog circuits such as constant current source and current mirror amplifier will be explained. Design methods for op-amps will be explained.
Digital circuit design	4	Design methodologies for combinational and sequential circuits are explained. Hardware algorithms for alithmetic logic unit will be discussed.
Evaluation and optimization of digital circuits	2	Methodologies for evaluating and optimizing the power consumption and delay of circuits are explained. Test methods will be also explained.
Full custom layout design	2	Design rules and layout verification methods will be explained. Full-custom layout design methods for analog circuits and basic logic gates are explained. Design methodologies for ROM and RAM will be explained.
Chip level layout design	2	Layout design methods and chip-level assembly methods in a cell-based design flow will be explained.
Confirmation of understanding	1	The level of understanding will be confirmed.

【Textbook】

【Textbook(supplemental)】Waste and Harris, "CMOS VLSI Design: A Circuits and Systems Perspective"

【Prerequisite(s)】Logic circuits, Computer engineering, Digital circuits, Embedded computer system

【】

【Web Sites】

【Additional Information】

61150

Information and Communication Engineering

情報通信工学

【Code】61150 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

62000

Electrical and Electronic Engineering in Biomedical Applications

生体医療工学

【Code】62000 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Instructor】T. Matsuda, T. Kobayashi, K. Koyamada, S. Ishii, S. Doi, H. Shimoda, S. Oba, E. Furutani

【Course Description】The course provides technologies based on electrical and electronic engineering in biomedical applications.

【Grading】A report is given in the class on each theme for evaluating the level of understanding of the fundamentals of electrical and electronic engineering in biomedical applications. Rating is based on the comprehensive evaluation of the reports.

【Course Goals】To acquire fundamental knowledge of physiological phenomena and functions, and mathematical models, and understand simulation and analysis methods in biomedical applications

【Course Topics】

Theme	Class number of times	Description
cell/biodynamics simulation	2-3	electrophysiology, computer simulation of cell and biodynamics
brain function measurement	2-3	brain nerve system, magnetoencephalogram (MEG), functional magnetic resonance imaging (fMRI), and their applications
visualization	2-3	visualization techniques for numerical simulation, steering, optimization
modeling and simulation of brain nerve system	2-3	simulation of information processing in neuron, mathematical modeling and analysis of higher brain function, bioinformatics
cognitive engineering	2-3	features of human cognitive activities from the viewpoint of psychology, congnitive engineering and its applications
biomedical and clinical systems	2-3	design and analysis of physiological state control system, system engineering approach and biomedical application to life

【Textbook】Handouts are given at the class.

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】The contents of the lecture and their order are subject to changes depending on the situation each year.

61160

Solid State Physics and Engineering

電子物性工学

【Code】61160 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Prof. Dr. Masashi Shiraishi

【Course Description】Spintronics handles a wide variety of solid-state physics, and students are requested to understand various physics including quantum and statistical physics. We review a basis of solid-state physics, and then study mathematical physics such as group theory. The final goal is to master the cutting edge of modern solid-state physics for understanding frontier studies in spintronics.

【Grading】Exam. and reports

【Course Goals】As described in the course description

【Course Topics】

Theme	Class number of times	Description
crystal structure and periodicity	2	
k-space	3	
quantum mechanics in solid-state physics	3	
bonding in solids	2	
physics of quasi-particle	1	
magnetics and spintronics	3	
	1	

【Textbook】None

【Textbook(supplemental)】

【Prerequisite(s)】Brief review of solid-state physics until the 3rd year courses.

【】

【Web Sites】

【Additional Information】

60580

Laws and Regulations of Electric Power Engineering

電気法規

【Code】60580 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	2	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

60590

Laws and Regulations of Radio Wave Engineering

電波法規

【Code】60590 【Course Year】4th year 【Term】 【Class day & Period】 【Location】 【Credits】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	7	
	1	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

64000

English for Electrical and Electronic Engineering

電気電子英語

【Code】64000 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】2 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

21050

Engineering Ethics

工学倫理

【Code】21050 【Course Year】4th year 【Term】 【Class day & Period】Thu 3rd 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【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】 【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.

【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】

【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】 【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 6th.

【Grading】Test, reports, laboratory performance.

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

【Course Topics】

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

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

【Textbook(supplemental)】

【Prerequisite(s)】Note:

-Interactive lessons (discussion), Small group working method

-This course is held in English.

【】

【Web Sites】None

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

24010

Global Leadership Seminar I

ＧＬセミナーＩ（企業調査研究）

【Code】24010 【Course Year】 【Term】 【Class day & Period】 【Location】 【Credits】1 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	2~3	
	2~3	
	12	
	3~4	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

25010

Global Leadership Seminar II

ＧＬセミナーⅡ（課題解決演習）

【Code】25010 【Course Year】 【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
	1	
	2	
	1	
	3	
	7	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

24020

International Internship of Faculty of Engineering I

工学部国際インターンシップ１

【Code】24020 【Course Year】 【Term】 【Class day & Period】 【Location】 【Credits】1 【Restriction】

【Lecture Form(s)】Exercise 【Language】English, et al.

【Instructor】Faculty of Engineering, Professor, Hitoshi Mikada and the related faculty members

【Course Description】Acquisition of international skills with the training of foreign language through the to internship programs hosted by the University, the Faculty of Engineering, or the Departments in the Department.

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

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

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

25020

International Internship of Faculty of Engineering 2

工学部国際インターンシップ２

【Code】25020 【Course Year】 【Term】 【Class day & Period】 【Location】 【Credits】2 【Restriction】

【Lecture Form(s)】Exercise 【Language】English, et al.

【Instructor】Faculty of Engineering, Profesor, Hitoshi Mikada, and the related faculty members

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

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

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

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【】

【Web Sites】

【Additional Information】

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〒 606-8501 京都市左京区吉田本町

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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/

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