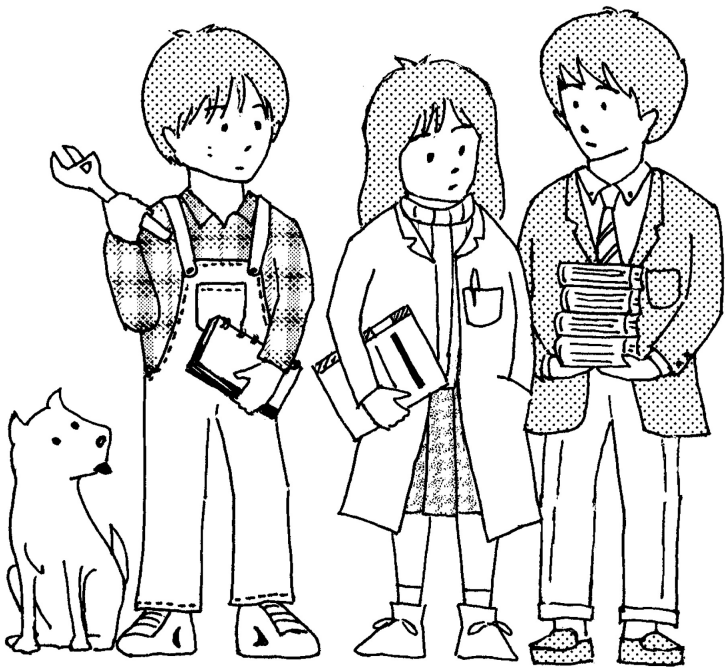
SYLLABUS *2010*

[D] Electrical and Electronic Engineering



Kyoto University, Faculty of Engineering

[D] Electrical and Electronic Engineering

Electrical and Electronic Engineering

60740

Introduction to Electrical and Electronic Engineering

電気電子工学概論

【Code】60740 【Course Year】1st year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60630

Fundamentals of Circuit Theory

電気回路基礎論

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
DC circuit	3	
Differential equation of circuit	5	
AC circuit	4	
two-port circuit	2	

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
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	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

230111

Exercises in Information Processing Basics

基礎情報処理演習

【Code】230111 【Course Year】1st year 【Term】2nd term 【Class day & Period】 【Location】

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

【Course Description】In this course we will exercise the basic usage of UNIX-like OS and basic techniques of report writing with LaTeX. Short tasks and reports will be required in each class. A short test will be held during the term.

【Grading】Reports, short tests, and attendance records will be taken into account.

【Course Goals】This course aims to develop computer usage literacy for student-life in Kyoto university.

【Course Topics】

Theme	Class number of times	Description
An introduction to UNIX OS	2	Basic concepts on operating systems, UNIX, and network security will be explained. Also, operations for X-windows system will be demonstrated
Basic usage of UNIX OS	2	Basic usage of the file-system and command shell will be exercised.
Emacs	1	Basic usage of emacs editor will be exercised.
LaTeX	2	Basic techniques of report preparation based on LaTeX will be acquired.
Figures and graphs	2	Basic usage of gnuplot, tgif, and xv for preparing figures and graphs, and the usage of them in the LaTeX document will be acquired.
File-formats	1	Basic techniques of file-format transformation will be acquired.
Exercise	4	

【Textbook】Text for Exercises in Information Processing Basics in Japanese; available in Kyoto-university Co-op shop.

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22017

Information Processing Basics

基礎情報処理

【Code】22017 【Course Year】1st year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60100

Electronic Circuits

電子回路

【Code】60100 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【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	
Fundamentals of transistor circuits	3	
Various amplifier circuits	3	
Operational amplifiers	2	
Oscilators	2	
Others	1	

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

【Textbook(supplemental)】

【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.)

【Web Sites】Link to the homepage of this course is here; (https://www.t.kyoto-u.ac.jp/lecturenotes/fe/d/60100/outline) 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 the "page of lecture materials" in the homepage of the faculty of engineering (https://www.t.kyoto-u.ac.jp/lecturenotes).

60750

Electrical and Electronic Engineering Practice A

電気電子工学実験A

【Code】60750 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	4	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

61020

Mathematics for Electrical and Electronic Engineering 1

電気電子数学 1

【Code】61020 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【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】Reports and a term examination with the textbook

【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	1	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, Dirac delta function
Laplace Transform	2	Laplace transform, inverse Laplace transform, initial value problems of ODE

【Textbook】Mathematical Methods for Physicists, Sixth Edition, Arfken & Weber

【Textbook(supplemental)】

【Prerequisite(s)】Calculus, Vector Analysis, Functions of Complex Variable, and English comprehension of the level of VOA Special English

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60120

Logic Circuits

論理回路

【Code】60120 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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 combinatorial 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	3-4	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	2	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.

【Textbook】Naofumi Takagi, Logic Circuits, Shoukou-dou.

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

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60160

Computer Architecture Basics

計算機工学

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	3	
	2	
	3	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60130

Information Theory

情報理論

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60150

Fundamentals of Electron Physics and Devices

物性・デバイス基礎論

【Code】60150 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60401

Semiconductor Engineering

半導体工学

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60770

Electrical and Electronic Engineering Advanced Practice A

電気電子工学実習 A

【Code】60770 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60780

Electrical and Electronic Engineering Advanced Practice B

電気電子工学実習 B

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【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】 【Term】2nd term 【Class day & Period】 【Location】 【Credits】3

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

【Course Description】

【Grading】Grading will be made based on reports, interview, etc.

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

90302

Graph Theory

グラフ理論

【Code】90302 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60220

Electric Circuits

電気回路

【Code】60220 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Distributed and lumped circuit	1	
Transient analysis	5	
AC analysis	3	
Transient analysis of lumped circuit	3	
synthesis of circuit	2	

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

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

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【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	3-4	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.

【Textbook】Hand-outs will be provided.

【Textbook(supplemental)】

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

【Web Sites】

【Additional Information】

61010

Electric and Electronic Measurement

電気電子計測

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60690

Electric and Electronic Measurement 1

電気電子計測 1

【Code】60690 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60710

Electric and Electronic Measurement 2

電気電子計測 2

【Code】60710 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60260

Control Engineering

自動制御工学

【Code】60260 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【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	3 ～ 4	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.

【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.

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

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

【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	4 〜 5	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.

【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)

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

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

【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	6	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
Solution methods for nonlinear programming problems without constraints	2-3	optimality conditions for nonlinear programming problems without constraints, steepest descent method, conjugate gradient method, Newtom method, and quasi-Newtom method
Solution methods for nonlinear programming problems with constraints	2-3	optimality conditions for nonlinear programming problems with constraints, Lagrange function, duality, saddle point theorem, penalty function 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

【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.

60670

Intelligent Systems

知能型システム論

【Code】60670 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60290

Electric Machines 2

電気機器 2

【Code】60290 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60720

Power Electronics

パワーエレクトロニクス

【Code】60720 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【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 (80%) and homework (20%).

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

【Course Topics】

Theme	Class number of times	Description
Outline of power electronics	3	Introduction of power electronics and switching circuit.
dc/dc convertors	3	The dynamic behavior and characteristics of Buck and Boost converters are explained.
ac/dc convertors	3	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	4	As the applications of power electronics, the motor drive by inverters are lectured.
Summary	1	The classes are summarized.

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

【Textbook(supplemental)】

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

【Web Sites】https://www.t.kyoto-u.ac.jp/lecturenotes/fe/d/60720/syllabus

【Additional Information】Students are recommended to download the note from home page.

60300

Electric Power Generation

発電工学

【Code】60300 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60310

Electrical Discharge and Breakdown

放電工学

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60320

Modulation Theory in Electrical Communication

通信基礎論

【Code】60320 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60330

Information Transmission

情報伝送工学

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60340

Telecommunication Networks

通信ネットワーク

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60350

Radio Engineering 1

電波工学 1

【Code】60350 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【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 equation. 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.

【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	3 ～ 4	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.
Basics of antennas	3 ～ 4	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.
Various antennas	3 ～ 4	We study principle, structure, and basic analysis methods of various realistic antennas such as loop, helical, array, and aperture antennas.
Radio wave propagation	3 ～ 4	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.

【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.

【Web Sites】

【Additional Information】

60360

Microwave Engineering

マイクロ波工学

【Code】60360 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60370

Computer Software

計算機ソフトウェア

【Code】60370 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60380

Computer Systems

計算機システム

【Code】60380 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60610

Digital Signal Processing

ディジタル信号処理

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60410

Plasma Engineering

プラズマ工学

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

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

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

【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	4	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 requested.

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60440

Fundamentals of Optical Engineering 1

光工学 1

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

62000

Electrical and Electronic Engineering in Biomedical Applications

生体医療工学

【Code】62000 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【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
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】https://www.t.kyoto-u.ac.jp/lecturenotes/fe/d/62000

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

60470

Radio Engineering 2

電波工学 2

【Code】60470 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60480

Optical Communications

光通信工学

【Code】60480 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60500

Power System Engineering

電力系統工学

【Code】60500 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Instructor】Y.Shirai, T.Hikihara, and others

【Course Description】Power system is a system which includes generators, transmission lines, power station, and related elements. In the class, at first, the outline of the system is slightly introduced. After the introduction, the regulation of the frequency and the voltage is explained. Then, economical operations and the reliabilities of supply are also the main topics.

【Grading】Examination and homework. Homework will be requested several times.

【Course Goals】Students are requested to understand the configuration of power system, the outline, the operation, and the regulation.

【Course Topics】

Theme	Class number of times	Description
Outline of power system	2.5	The outline of the power system is explained. The important topics are focused in detail.
Frequency regulation	3	Power system keeps the frequency at 50 Hz or 60 Hz. The frequency regulation is explained based on the configuration of power system.
Voltage regulation	3	In power systems, the voltage levels, from 500 kV to 100V, are defined to keep industrial activities in smooth. The method for voltage regulation is focused on in this section.
Economical operation	3	Many hydro, fuel, and nuclear generators are connected in power systems with keeping synchronization. The usage of resources and electric power rate due to the economical operation. In this section, the method for keeping the economical operation in the system.
Reliablities of power system	1.5	Power system is requested to transfer electric power without any trouble. It is the duty of the system operation. Even in fatal perturbations like lightening, electric power must be supplied without blackout. In this section, the reliability of the system will be focused on.

【Textbook】Y.Ohsawa, Power system engineering, Ohmsha.

【Textbook(supplemental)】Y.Sekine, Power system engineering, Denki-shoin.

【Prerequisite(s)】Electric circuit, Power circuit, and Power generation engineering.

【Web Sites】

【Additional Information】Depending on the schedules, some part of the lectures might be skipped.

60510

Power System Insulation

絶縁設計工学

【Code】60510 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60730

Man-Machine Systems Engineering

マンマシンシステム工学

【Code】60730 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	3	
	1	
	3	
	3	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60530

Applied Electrical Engineering

電気応用工学

【Code】60530 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60540

Acoustics

音響工学

【Code】60540 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

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

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

【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.

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

【Textbook(supplemental)】

【Prerequisite(s)】Vacuum Electronic Engineering 1

【Web Sites】

【Additional Information】

60560

Optoelectronic Devices

光電子デバイス工学

【Code】60560 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

60570

Fundamentals of Optical Engineering 2

光工学２

【Code】60570 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

61040

Electrical　Conduction in Condensed Matter

電気伝導

【Code】61040 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction

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

【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.

This lecture is open to the graduate students as well as to undergraduate students. The credit is given to those who passed the examination either as a credit of the undergraduate course, which is ordinary, or as the one for the graduate course after he or she is admitted in the Electrical Engineering Department or Department of Electronic Science and Engineering. In this sense, those who are engaged in the advanced-combined graduate course program and want to keep a credit for the graduate course are encouraged to attend this class.

【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
Drude model and Boltzmann equation	4	dc Conductivity and electrical conduction in a magnetic field are dealt with using the relaxation time based on the Drude model. The magnetoresistance and the Hall effect are discoursed. Corbino device and the van der Pauw method are discoursed and their electrical conduction is given analytically as a concrete example. The celebrated Boltzmann equation is derived at the beginning of this term and based on this equation the fundamental equation for the electrical conductivity is discoused.
Fundametals of quantum mechanics and the wavevector space	2	Very fundamental concepts of the quantum mechanics are discoursed using bra- and ket-vectors. After Fermi's golden rule is derived, the wavevector space is discoused, which plays an important role in the motion of electrons in solids.
Free electron model and the elecronic conduction in metals	3	The Fermi-Dirac statistics is discoursed, which is obeyed by electrons. The distribution for electrons when they are degenerated. The free electron model is discoursed as an ideal Fermi gas, extending to the electronic specific heat, thermal emission of electrons, and others. Various concepts of the Fermi surface, electron in a magnetic field, the reciplocal lattice, the effective mass and so on. A very important theorem of Bloch is derived and used to obtain the Boltzmann-Bloch equation, which is very important in calculating the electrical conduction in solids.
Electron-phonon interaction and the electrical conduction in metals and semiconductors	3	The concept of phonons is discoursed as are represented by energy quanta appearing by the result of quantization of the lattice vibration. The density states of phonon is derived, which is used to obtain the specific heat of lattice vibraion in passing. The scattering by phonons and that by electrons are discoursed with a stress on the main role in the conduction of electrons in solids. Based on this scattering mechanism, the resistivity and its temperature dependence are discoursed, which finally leads to the description of the famous Bloch-Gruneisen formula. The electrical conduction in semiconductors is also discoused with a special attention on the scattering.
Electrical conduction in superconductors	2	A remarkable phenomenon of superconductivity is discoursed first. Then, a phenomenological model of superconductivity by London brothers is discoursed, in which the London equation is derived and the Meissner effect, the perfect diamagnetism, is explained in terms of the London equation and the Maxwell equations. Very important concepts in superconductivity, such as the coherence length, penetration depth, lower and upper critical field, the order parameter, the energy gap, quasiparticles, and the semiconductor model are discoursed. Finally, the high frequency impedance or the surface impedance of superconductors is discoursed based mainly on the London model.
High frequency electical conductivity and optical conductivity	1	As an asymptotic form of the ac electrical conductivity when the frequency is increased to higher than several tens of THz, we have an optical conductivity, which is also described as an imaginary part of the dielectric constant. Thus we have a unified picture of the ac conductivity. By means of this term, the surface impedance, the skin effect, and the anomalous skin effect are discoursed. The famous Kramers-Kronig relation is derived from the causality rule to give a usuful relationship between the real part and the imaginary part of the optical conductivity or the dielectric constant.

【Textbook】Textbook is not used in the class in particular.

【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.

【Web Sites】Supplements to the lecture are given in the web site, of which the URL is http://www.kuee.kyoto-u.ac.jp/~suzuki/index.html.

【Additional Information】The content of the lecture is subject to change depending on the number of times of the lecture.

60580

Laws and Regulations of Electric Power Engineering

電気法規

【Code】60580 【Course Year】4th year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	7	
	3	

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

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

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

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

21050

Engineering Ethics

工学倫理

【Code】21050 【Course Year】4th year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

21010

Global Leadership (Introduction)

グローバルリーダーシップ（序論）

【Code】21010 【Course Year】1st year 【Term】 【Class day & Period】 【Location】 【Credits】2

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1~3	
	4	
	5~15	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22000

Global Leadership (Exercise in English)

グローバルリーダーシップ（英語演習）

【Code】22000 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22100

Global Leadership (Engineering and Ecology)

グローバルリーダーシップ（工学とエコロジー）

【Code】22100 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】1

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22200

Global Leadership (Engineering and Economy)

グローバルリーダーシップ（工学と経済）

【Code】22200 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】1

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

24000

Global Leadership (Advanced Seminar Ⅰ)

グローバルリーダーシップ（セミナーⅠ）

【Code】24000 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

25000

Global Leadership (Advanced Seminar Ⅱ)

グローバルリーダーシップ（セミナーⅡ）

【Code】25000 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

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

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

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- [B] Architecture
- [C] Engineering Science
- [D] Electrical and Electronic Engineering
- [E] Informatics and Mathematical Science
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本文中の下線はリンクを示しています．リンク先はオンライン版を参照してください．

京都大学工学部 2010.4