

Numbering code			
Course title <English>	工学倫理 Engineering Ethics	Affiliated department, Job title, Name	Graduate School of Energy Science Professor, TAKUDA HIROHIKO Graduate School of Engineering Professor, ATOMI HARUYUKI Graduate School of Engineering Senior Lecturer, KANEKO KENTAROU
Target year	4th year students or above	Number of credits	2
		Course offered year/period	2019/First semester
Day/period	Thu.3	Class style	Lecture
		Language	Japanese
[Outline and Purpose of the Course]			
Modern ethics based on engineering aspect are becoming essential to present engineers and scientists. Instructors from various faculties give lectures about ethics in their research fields.			
[Course Goals]			
The goal of this class is to understand engineering ethics, and to develop the ability to judge by yourself when you encounter ethical issues.			
[Course Schedule and Contents]			
Significance to learn engineering ethics. (4/11) 1time. As an introduction to this course, the meaning of engineering ethics and the significance to learning it are explained. Examples are shown in building engineering area on daily disastrous accidents and fire event. The significances of engineering ethics to those examples are discussed. (K. Harada: Architecture) Geotechnical engineering and engineering ethics. (4/18) 1 time. Geotechnical Engineering is indispensable in discussing the underground public use, slope stability, geo-sequestration of byproduct for the energy generating. Introducing some examples of natural disasters and construction accidents, geotechnical engineering and engineering ethics will be discussed. (K. Kishida: Global Engineering) Engineering ethics as an applied ethics. (4/25) 1 time. In this lecture, I will show the basic Idea of Engineering Ethics by comparing with the other fields of Applied Ethics. And show its unique character in the age of information technology. (M. Mizutani: Graduate School of Letters) Ethical theories for engineering ethics. (5/2) 1 time. This lecture focus on various ideas in ethics (utilitarianism, deontology, virtue ethics, professional ethics etc.) which will be useful for thinking about particular ethical problems in engineering ethics. (T. Iseda: Graduate School of Letters) Art-view concept for engineering. (5/9) 1time. Concept of "quality of life" is required for human related engineering. Some practical examples in medical-care and welfare fields will be introduced, and problem of the QOL-evaluation will be discussed from both function-optimizing view point and art view point. (N. Tomita: Engineering Science) Ethics of biotechnology and stem cell research. (5/16) 1time. With the rapid development of genome editing technology and stem cell engineering, editing of the human genome that goes beyond generations has become possible, at least technically. In this lecture, I will introduce these latest technologies and think about ethical problems accompanying technological development. (G. Eiraku: Industrial Chemistry) Research and engineering ethics. (5/23) 1time. It is said that He that will do no ill, must do nothing that belongs thereto. The sense of ethics necessary to whom conducts research and engineering work in society is discussed in terms of the importance of equitability and fair evaluation to anyone involved in each area of research or engineering. (H. Mikada: Global Engineering) Ethics in biomedical engineering. (5/30) 1time. Recent dramatic progress in biology-related techniques, such as reproductive medicine, genome editing, and clone-animal techniques, is causing revolutions in the fields of			
----- Continue to 工学倫理(2)			

工学倫理(3)	

[Regarding studies out of class (preparation and review)]	
The assignment of the report will be given for each lesson.	
(Others (office hour, etc.))	
The class order is subject to change.	
*Please visit KULASIS to find out about office hours.	

工学倫理(2)	

medicines and food productions. Associated with it, problems of their safety and ethics are arising, which should be addressed by our societies. In this class, the recent progress in biology-related techniques, and problems we have and will have in near future are described. (M. Shirakawa: Industrial Chemistry) Patents and ethics (Part 1). (6/6) 1time. This course will teach the students about 1) patent systems which protect inventions and research results and 2) ethical issues in patents. The first class, in preparation for the next subject of patent ethics, introduces Japan ' s patent system with comparisons to the patent systems in the world ' s major countries and international framework. (M. Nakagawa: Electrical and Electronics Engineering) Patents and ethics (Part 2). (6/13) 1time. Students, equipped with the basic knowledge of patent systems by the previous lecture, will get familiar with actual case studies on ethical and legal issues in patents. (M. Nakagawa: Electrical and Electronics Engineering) Ethics required for advanced science. (6/27) 1time. Engineers and researchers are at the forefront of preventing harm caused by advanced chemistry. Think about social roles and ethics required by engineers and researchers through relationships between chemical substances and environmental problems, efforts to avoid hazards of nanomaterials. (K. Miura: Industrial Chemistry) Ethics in press release. (7/4) 1 time. Press Release is an essential process for introducing the research to our society through various medias. In this lecture, issues related to Press Release in University are addressed and discussed. (K. Umeno: Informatics and Mathematical Science) Failure accidents and inspection/maintenance (7/11) 1time. On the occasions of failure accidents of vehicles and plants, the appropriateness of inspection/maintenance of their structures is often questioned. Some actual failure accidents are reviewed to discuss the importance of inspection/maintenance together with the relation to engineering ethics. (S. Biwa: Engineering Science) Ethics in nuclear engineering. (7/18) 1time. Discussion on engineering ethics in the TEPCO accident from view point of Tsunami evaluation by the Japanese government. (I. Takagi: Engineering Science) Ethical issues on sound design. (7/25) 1 time. Every working things consuming energy emits acoustic sound. Even a small sound energy affect human as noise and may create annoyance and health problems. Sound problems of various things are introduced in the lecture. Ethical issues, which shall be considered during design and operation environment, will be discussed. (Y. Takano: Architecture)	
[Class requirement]	
None	
[Method, Point of view, and Attainment levels of Evaluation]	
Class participation and reports.	
[Textbook]	
Lecture materials will be distributed.	
[Reference books, etc.]	
(Reference books)	
♯Omnibus Engineering Ethics a (Kyoritsu Shuppan Co., Ltd.) ISBN:978-4320071964 ♯Practical Engineering Ethics - A Short Course, New Edition a (Kagaku-Dojin Publishing Company,INC) ISBN:9784759811551 ♯Engineering Ethics (Revised Edition) a (CORONA PUBLISHING CO.,LTD.) ISBN:978-4-339-07798-8 ♯World of Engineering Ethics (3rd Edition) a (Morikita Publishing Co., Ltd.) ISBN:978-4-627-97303-9	
----- Continue to 工学倫理(3)	

Numbering code			
Course title <English>	工学序論 Introduction to Engineering	Affiliated department, Job title, Name	Graduate School of Engineering Senior Lecturer, MAEDA MASAHIRO Graduate School of Engineering Senior Lecturer, MATSUMOTO RIYOUSUKE Graduate School of Engineering Senior Lecturer, YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer, KANEKO KENTAROU Graduate School of Engineering Senior Lecturer, ASHIDA RIYUICHI
Target year	1st year students or above	Number of credits	1
		Course offered year/period	2019/Intensive, First semester
Day/period	Intensive	Class style	Lecture
		Language	Japanese
[Outline and Purpose of the Course]			
[Course Goals]			
[Course Schedule and Contents]			
,1~2times, ,6times,			
[Class requirement]			
None			
[Method, Point of view, and Attainment levels of Evaluation]			
[Textbook]			
[Reference books, etc.]			
(Reference books)			
[Regarding studies out of class (preparation and review)]			
(Others (office hour, etc.))			
*Please visit KULASIS to find out about office hours.			

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Numbering code			
Course title <English>	GLゼミナーⅠ (企業調査研究) Global Leadership Seminar I	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,MAEDA MASAHIRO
Target year	2nd year students or above	Number of credits	1
Course offered year/period	2019/Intensive, year-round		
Day/period	Intensive	Class style	Seminar
Language	Japanese		
[Outline and Purpose of the Course]			
The purpose of this course is to study about how worldwide leading company, institute, etc. make proposals and find solutions for expanding their own technologies to the international market. Throughout hands-on training on their laboratory, students investigate the methodology of team organization, proposal, market prediction and conception ability by group works. After the investigation, students are expected to improve their comprehension and explanation capability. As extended exercise subject of this course, the Global Leadership Seminar II is opened in the second semester.			
[Course Goals]			
The goal of this course is to improve student's comprehension and explanation capability for processes of proposal and expansion on the international market investigating worldwide leading companies by group work.			
[Course Schedule and Contents]			
Week 1, Guidance Week 2-13, Hands-on training Week 14, Pre-presentation Week 15, Final presentation			
[Class requirement]			
How to register will be announced later. Students who want to join this course is requested to attend the first class.			
[Method, Point of view, and Attainment levels of Evaluation]			
Students are prohibited to skip hands-on training. Evaluation will be based on presentation.			
[Textbook]			
Not used			
Continue to GLゼミナーⅠ (企業調査研究) (2)			

GLゼミナーⅠ (企業調査研究) (2)	
[Reference books, etc.]	
(Reference books)	
(Related URLs)	
http://www.glc.t.kyoto-u.ac.jp/ugrad	
[Regarding studies out of class (preparation and review)]	
Investigating companies in advance. Analyzing the result from hands-on training. Preparing presentation.	
(Others (office hour, etc.))	
How to register will be announced later. Students who want to join this course is requested to attend the first class. Students are prohibited to skip hands-on training. Evaluation will be based on presentation.	
*Please visit KULASIS to find out about office hours.	

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Numbering code			
Course title <English>	工学部国際インターンシップ 1 Faculty of Engineering International Internship 1	Affiliated department, Job title,Name	Approved
Target year	3rd year students or above	Number of credits	1
Course offered year/period	2019/Intensive, year-round		
Day/period	Intensive	Class style	Seminar
Language	Japanese and English		
[Outline and Purpose of the Course]			
Acquisition of international skills with the training of foreign language through the internship programs hosted by the University, the Faculty of Engineering, or the undergraduate school the applicant belongs to.			
[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 Schedule and Contents]			
Overseas Internship,1time,The contents to be acquired should be described in the brochure of each internship program. Final Presentation,1time,A presentation by the student is required followed by discussion among participants.			
[Class requirement]			
Described in the application booklet for each internship program. The registrant is requested to have enough language skills for the participation.			
[Method, Point of view, and Attainment levels of Evaluation]			
Merit rating is done based on the presentation or reports after each internship program. Each Department responsible to identify if the credit earned by this subject to be included as mandatory ones or not. If the credit is not included in the undergraduate school in which the participant belongs to, the credit is granted by the Global Leadership Education Center as a optional credit. The number of credits, either 1 or 2, will be determined depending on the contents and the duration of the program that the participant has participated in.			
[Textbook]			
[Reference books, etc.]			
(Reference books)			
[Regarding studies out of class (preparation and review)]			
(Others (office hour, etc.))			
It is required for students to check if the internship program to participate in could be evaluated as part of mandatory credits or not and could earn how many credits before the participation to the undergraduate school or educational program the student in enrolled. If the credit could not be treated as mandatory ones, get in touch with the Global Leadership Engineering Education Center.			
*Please visit KULASIS to find out about office hours.			

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Numbering code			
Course title <English>	GLゼミナーⅠⅠ (課題解決演習) Global Leadership Seminar II	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,MAEDA MASAHIRO Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU
Target year	2nd year students or above	Number of credits	1
Course offered year/period	2019/Intensive, Second semester		
Day/period	Intensive	Class style	Seminar
Language	Japanese		
[Outline and Purpose of the Course]			
This course is a small-group workshop program where students are supposed to extract or set up challenges by themselves aiming at creating new social values. In concrete, abilities of planning and problem-solving are trained through group works in residential training and skills of presentation and communication are enhanced through oral presentations regarding contents of the proposal at each step of the process from a preliminary draft to its completion.			
[Course Goals]			
Ability of planning, from extraction or setting up challenges to proposal of solutions aiming at creating new social values, is trained through group works.			
[Course Schedule and Contents]			
Orientation,1time,A brief overview and a schedule of the course are explained and working groups are organized. Lectures,2times,Lectures by experts are given. Group works,3times,Setting up challenges, extraction of problems, collecting information, and group works are done. Residential training,7times,Through intensive group works based on discussion, a proposal for solving problems is planned, a draft report is made, and a few presentations are made. Preliminary review meeting,1time,A preliminary review meeting is held and discussions are made. Report meeting,1time,Final presentations are made and reports are submitted.			
[Class requirement]			
None			
[Method, Point of view, and Attainment levels of Evaluation]			
It is required to join the residential training. A report meeting is held and comprehensive evaluation concerning abilities in group discussion to extract or set up challenges and to propose solutions for achieving a goal is made through presentation of the proposal as well as a submitted report.			
[Textbook]			
Will be indicated as necessary.			
Continue to GLゼミナーⅠⅠ (課題解決演習) (2)			

GLセミナーⅠⅠ (課題解決演習) (2)	
[Reference books, etc.]	
(Reference books) Will be indicated as necessary.	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.))	
Course open period: October to January How to register the course will be instructed. *It depends on divisions which students belong to whether the earned credits are admitted as credits required for graduation. Please refer to the syllabus of your division. *Please visit KULASIS to find out about office hours.	

Numbering code			
Course title <English>	電気電子回路 Electric and Electronic Circuits	Affiliated department, Job title, Name	Graduate School of Engineering Professor, WADA OSAMI
Target year	1st year students or above	Number of credits	2
Course offered year/period	2019/Second semester		
Day/period	Mon.1	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
The first half of the course discusses the basics of three phase circuits, methods of analyzing passive circuits that include transformers, and the construction of systematic circuit formulas. The second half explains methods of analyzing circuits that include active components, such as transistors, using electric circuit theory, then describes the handling of frequency characteristics of circuits and basic switching operations of transistor circuits.			
[Course Goals]			
<ul style="list-style-type: none"> Review basic knowledge on handling of electric circuits, and develop the ability to analyze basic electric circuits. Understand the basics of three phase circuits. Understand circuits that include independent voltage and current sources and controlled sources, as well as equivalent circuits of transformers. Understand handling of frequency characteristics of circuits. Understand methods to analyze nonlinear circuits including active components as linear circuits. Understand the basic operation of semiconductor devices. 			
[Course Schedule and Contents]			
(1-2) Basics of three phase circuits, [2 classes]: Following up on Basic Theory of Electric Circuits (60630), review the representation of sine waves in complex form, and explain the basics of single phase three wire circuits and symmetrical three phase circuits.			
(3-6) Passive circuit analysis methods, [4 classes]: Explain handling of circuits using Thevenin's theorem and Norton's theorem, equivalent sources and equivalent circuits. Explain mutual inductance and transformers; equivalent circuits, the coupling factor, ideal transformer, impedance conversion, analysis of circuits including transformers.			
(7-8) Circuit equations, [2 classes]: Explain construction of the loop equations and the nodal equations that can realize systematic circuit analysis even when very large number of elements are included.			
(9) Basics of semiconductor, [1 class]: Explain p-n junctions of semiconductors that make up diodes, transistors, etc., as well as their basic characteristics.			
(10-11) Active circuit analysis, [2 classes]: Explain DC biasing for linear operation of electron tubes, transistors, etc. as well as AC small signal equivalent circuits for handling amplification of signals, etc., and explain the concept of controlled voltage sources and controlled current sources, and methods of analyzing electronic circuits using linear circuit theory.			
(12-13) Frequency characteristics of electronic circuits, [2 classes]: Explain dB (decibel) notation for representing the ratio of electric power, voltage, current, etc., and describe			
Continue to 電気電子回路(2)			

Numbering code			
Course title <English>	工学部国際インターンシップ2 Faculty of Engineering International Internship 2	Affiliated department, Job title, Name	Approved
Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Intensive, year-round		
Day/period	Intensive	Class style	Seminar
Language	Japanese and English		
[Outline and Purpose of the Course]			
Acquisition of international skills with the training of foreign language through the participation to the international internship programs held by the Faculty of Engineering or its subsidiary bodies.			
[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 Schedule and Contents]			
Overseas Internship, 1time, The contents to be acquired should be described in the brochure of each internship program. Final Presentation, 1time, A presentation by the student is required followed by discussion among participants.			
[Class requirement]			
Described in the application booklet for each internship program. The registrant is requested to have enough language skills for the participation.			
[Method, Point of view, and Attainment levels of Evaluation]			
Merit rating is done based on the presentation or reports after each internship program. Each Department responsible to identify if the credit earned by this subject to be included as mandatory ones or not. If the credit is not included in the undergraduate school in which the participant belongs to, the credit is granted by the Global Leadership Education Center as an 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.			
[Textbook]			
[Reference books, etc.]			
(Reference books) その他、柳沢: 回路理論基礎 (電気学会大学講座) (電気学会) ISBN: 9784886862044 ibid{}{} TW86015136) 北野: 電子回路の基礎 (培風館) isbn{}{}{456303553X} 北野: 電子回路の基礎 (http://www.kuee.kyoto-u.ac.jp/~kitano/ec/) (レイメイ社) ibid{}{}{BB04087527}			
[Regarding studies out of class (preparation and review)]			
"Course materials" are uploaded to KULASIS, so please download and refer to them as appropriate.			
(Others (office hour, etc.))			
After class (Monday, second period), I will be available to answer questions at the Yoshida Campus. Questions are also welcomed by email. *Please visit KULASIS to find out about office hours.			

Numbering code			
Course title <English>	電気電子回路(2)	Affiliated department, Job title, Name	
Target year	1st year students or above	Number of credits	2
Course offered year/period	2019/Intensive, year-round		
Day/period	Intensive	Class style	Seminar
Language	Japanese and English		
[Outline and Purpose of the Course]			
the frequency characteristics of simple amplifier circuits.			
(14) Basics of semiconductors and binary operation of active circuits, [1 class]: Describe transistor's switching operation.			
(15) Confirmation of learning attainment, [1 class]: Confirm the degree of learning attained in the course.			
[Class requirement]			
Students should have learned the content of Basic Theory of Electric Circuits (60630), or an equivalent basic course in electric circuits. It is not required to have obtained credits from the above courses.			
[Method, Point of view, and Attainment levels of Evaluation]			
Evaluation will be based on final examination grade. Report topics will be assigned in class, and reports on these themes will be factored into the final grade.			
[Textbook]			
奥村浩士: 電気回路理論 (朝倉書店) isbn{}{}{9784254220490} , Also, printouts are distributed ("Course materials" on KULASIS)			
[Reference books, etc.]			
(Reference books) その他、柳沢: 回路理論基礎 (電気学会大学講座) (電気学会) ISBN: 9784886862044 ibid{}{} TW86015136) 北野: 電子回路の基礎 (培風館) isbn{}{}{456303553X} 北野: 電子回路の基礎 (http://www.kuee.kyoto-u.ac.jp/~kitano/ec/) (レイメイ社) ibid{}{}{BB04087527}			
[Regarding studies out of class (preparation and review)]			
"Course materials" are uploaded to KULASIS, so please download and refer to them as appropriate.			
(Others (office hour, etc.))			
After class (Monday, second period), I will be available to answer questions at the Yoshida Campus. Questions are also welcomed by email. *Please visit KULASIS to find out about office hours.			

Numbering code					
Course title <English>	電磁気学 1 Electromagnetic Theory 1	Affiliated department, Job title,Name	Graduate School of Engineering Professor,MATSUO TETSUJI		
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Fri.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
Students will learn electrostatic field, electrostatic energy, electrostatic force in vacuum and dielectric media, and magnetostatic field in vacuum.					
[Course Goals]					
To understand basics of the electrostatics in vacuum and dielectric media, and the magnetostatics in vacuum.					
[Course Schedule and Contents]					
1. Electrostatic fields in vacuum (2-3 times)					
2. Electrostatic fields in dielectric media (2-3 times)					
3. Electrostatic energy, Electrostatic field and boundary value problems in electrostatic fields (5-6 times)					
4. Steady-state currents and magnetostatic fields in vacuum (3-4times)					
5. Academic achievement test (1 time)					
[Class requirement]					
Vector Analysis					
[Method, Point of view, and Attainment levels of Evaluation]					
By a term examination (raw score)					
[Textbook]					
島崎・松尾 『電磁気学』					
[Reference books, etc.]					
(Reference books)					
[Regarding studies out of class (preparation and review)]					
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(Others (office hour, etc.))					
*Please visit KULASIS to find out about office hours.					

Numbering code					
Course title <English>	電子回路 Electronic Circuits	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor,SUGIYAMA KAZUHIKO		
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Fri.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
Following the lecture of fundamentals of active device circuits in the course "Electric and Electronic Circuits", modeling of active devices, 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.					
[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 Schedule and Contents]					
Modeling of active devices,3times,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,3times,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,3times,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,2times,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.					
Oscillators,2times,The principle of the oscillator circuit is lectured as a concept of the positive feedback. Various oscillator circuits are introduced with their characteristics.					
Others,1time,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,1time,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.					
[Class requirement]					
quotElectric and Electronic Circuit (60030)quot and quotFundamentals of Circuit Theory (60630)quot. (The lecturer recommends moderate understanding of fundamentals of electric circuit as the minimum prerequisites in order to achieve this course.)					
Continue to 電子回路(2)					

Numbering code					
Course title <English>	電磁気学 2 Electromagnetic Theory 2	Affiliated department, Job title,Name	Graduate School of Engineering Professor,MATSUO TETSUJI Graduate School of Engineering Professor,AMEMIYA NAOYUKI		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Mon.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
Students will learn ferromagnetic media, electromagnetic force, electromagnetic induction, Maxwell's equations and electromagnetic wave.					
[Course Goals]					
To understand basics of the electromagnetics: ferromagnetic media, electromagnetic force, electromagnetic induction, Maxwell's equations and electromagnetic wave.					
[Course Schedule and Contents]					
Ferromagnetic media (3 times)					
Electromagnetic force (2-3 times)					
Electromagnetic induction (3-4 times)					
Maxwell's equations and electromagnetic wave (3-4 times)					
Computational electromagnetics (1-2 times)					
Academic achievement test (1 time)					
[Class requirement]					
Electromagnetic Theory 1					
[Method, Point of view, and Attainment levels of Evaluation]					
By a term examination (raw score)					
[Textbook]					
島崎・松尾 『電磁気学』					
[Reference books, etc.]					
(Reference books)					
[Regarding studies out of class (preparation and review)]					
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(Others (office hour, etc.))					
*Please visit KULASIS to find out about office hours.					

Numbering code					
電子回路(2)					

[Method, Point of view, and Attainment levels of Evaluation]					
Examination and reports. Details about evaluation of the reports are opened on the homepage of this lecture located on Panda.					
[Textbook]					
Masao Kitano 『Fundamentals of Electronic Circuits』 (Reimei Publishing, Kyoto) (ibid:BB04087527)					
[Reference books, etc.]					
(Reference books)					
In addition to Japanese books, Tietze and Schenk: Electronic Circuits (Springer) isbn{}{354050608X} isbn{}{9783540004295}; Hayes and Horowitz: Student Manual for the Art of Electronics (Cambridge) isbn{}{0521377099}					
(Related URLs)					
(Link to the homepage of this course is here: (https://panda.ecs.kyoto-u.ac.jp/portal/site/2019-110-6010-000) or (https://panda.ecs.kyoto-u.ac.jp/portal/). Sorry for Japanese version only.)					
[Regarding studies out of class (preparation and review)]					
In case you need.					
(Others (office hour, etc.))					
The topics will be selected owing to limit of lecture time. The students should prepare "Bar Cover" from the website of the Faculty of Electric and Electronic Engineering (http://www.s-ee.t.kyoto-u.ac.jp/ja/student/index.html) by themselves, and use it as a title page of each report and the exercise in the lecture. The homepage of this course is located on Panda (https://panda.ecs.kyoto-u.ac.jp/portal/). Contact the instructor after the lecture, when the students have any questions.					
*Please visit KULASIS to find out about office hours.					

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Numbering code							
Course title <English>	論理回路 Logic Circuits	Affiliated department, Job title,Name	Graduate School of Informatics Professor,ONODERA HIDETOSHI				
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/First semester		
Day/period	Fri.1	Class style	Lecture	Language	Japanese		
[Outline and Purpose of the Course]							
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.							
[Course Goals]							
From this lecture, you can obtain basic knowledge that enables the analysis and design of small-scale logic circuits both for combinational and sequential operations.							
[Course Schedule and Contents]							
Following topics will be covered. By assessing the understanding of the students and adding explanations and tasks when necessary, we will spend the number of weeks listed in [].							
(1) Basics of logic functions [2 weeks] Digital circuits and logic circuits, number systems, Boolean algebra, logic functions, and logical expressions are covered.							
(2) Logic minimization [4 weeks] Methods for logic minimization using Boolean cubes and Karnaugh maps, Quine-McCluskey method, properties of logic functions are explained.							
(3) Combinational circuit [2 weeks] Logic gates, analysis and design of combinational circuits, representative combinational circuits are discussed.							
(4) Sequential circuit [5 weeks] Operation and expression of sequential circuits, organization and operation of flip-flops, analysis and design of sequential circuits, synchronous counters and registers are explained.							
(5) Arithmetic circuit [1 week] 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.							
(6) Confirmation of understanding and feedback [1 week] The level of understanding on this lecture will be confirmed. Feedback will be given if necessary.							
----- Continue to 論理回路(2)							

Numbering code							
Course title <English>	情報理論 Information Theory	Affiliated department, Job title,Name	Graduate School of Informatics Associate Professor,SHINKUMA RIYOUICHI Graduate School of Informatics Associate Professor,YAMAMOTO KOJI				
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/Second semester		
Day/period	Tue.1	Class style	Lecture	Language	Japanese		
[Outline and Purpose of the Course]							
[Course Goals]							
[Course Schedule and Contents]							
.1time, .4times, .2times, .5times, .2times, .1time,							
[Class requirement]							
None							
[Method, Point of view, and Attainment levels of Evaluation]							
[Textbook]							
[Reference books, etc.]							
(Reference books)							
[Regarding studies out of class (preparation and review)]							
(Others (office hour, etc.))							
*Please visit KULASIS to find out about office hours.							

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論理回路(2)							
[Class requirement]							
None							
[Method, Point of view, and Attainment levels of Evaluation]							
The level of achievement toward the goal of this lecture will be examined by a regular exam.							
[Textbook]							
Naofumi Takagi 『Logic Circuits』 (Ohmsha) ISBN:9784274215995							
[Reference books, etc.]							
(Reference books)							
Teruhiko Yamada 『Theory of Logic Circuits』 (Morikita Publishing) ISBN:4627805306 Keikichi Tamaru 『Basics of Logic Circuits』 (Kougaku-Tosho) ISBN:4769202040							
[Regarding studies out of class (preparation and review)]							
Related part in the textbook should be read before lecture. Practices in the textbook should be solved when the topic is covered by the lecture.							
(Others (office hour, etc.))							
*Please visit KULASIS to find out about office hours.							

Numbering code							
Course title <English>	物性・デバイス基礎論 Fundamentals of Electron Physics and Devices	Affiliated department, Job title,Name	Graduate School of Engineering Professor,KIMOTO TSUNENOBU				
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/First semester		
Day/period	Tue.1	Class style	Lecture	Language	Japanese		
[Outline and Purpose of the Course]							
[Course Goals]							
[Course Schedule and Contents]							
Quantum mechanics,4-5times, Statistics,3-4times, Solid state physics,2-3times, Electrons in solids,3-4times, Summary,1time,							
[Class requirement]							
None							
[Method, Point of view, and Attainment levels of Evaluation]							
[Textbook]							
Tanaka Tetsuro: Busseikougaku no kiso (Asakura Shoten) isbn{ }{4254210035}							
[Reference books, etc.]							
(Reference books)							
[Regarding studies out of class (preparation and review)]							
(Others (office hour, etc.))							
*Please visit KULASIS to find out about office hours.							

Numbering code					
Course title <English>	計算機工学 Computer Hardware Design	Affiliated department, Job title,Name	Graduate School of Informatics Professor,SATOU TAKASHI		
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Mon.4	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[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 Schedule and Contents]					
Computer systems overview (2 weeks): Fundamentals of computers --- history, data representation and arithmetic on computers, instruction sets, and components. Number representation and binary arithmetics (4 weeks): Integers, fixed point float, IEEE 754 floating numbers; binary arithmetic, and logic operations in ALU. Machine language (2 weeks): Instruction formats of RISC processors; basic assembly language ALU and data path (2 weeks): Composition of ALU, highlighting the correspondence with ISA Control path and pipelining (4 weeks): Data flow and control in the computer; pipelining; instruction execution Course summary (1 week): Summarize overall computer architecture					
[Class requirement]					
Logic circuits (60120).					
[Method, Point of view, and Attainment levels of Evaluation]					
A final course grade is given on the basis of the end-of-term exam. Results of homework assignments given in almost every class may be additionally considered for the grading.					
[Textbook]					
Printed handouts are provided. Recommended to have following supplemental textbook.					
----- Continue to 計算機工学(2)					

Numbering code					
Course title <English>	電気回路 Electric Circuits	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor,HISAKADO TAKASHI		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Tue.3	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
The course introduces the fundamentals of transmission line which is essential 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.					
[Course Goals]					
Students are expected to learn the transient and steady states of the circuit with transmission line.					
[Course Schedule and Contents]					
Distributed and lumped circuit,1time,We introduce transmission line. Transient analysis,5times,We introduce the circuit model of transmission line and derive telegraph equation. Transient analysis in transmission line is explained. AC analysis,3times,Steady state analysis in transmissionline. Transient analysis of lumped circuit,3times,Transient analysis with Laplace transform synthesis of circuit,2times,Synthesis of circuit by network functions. academic achievement test,1time,The level of understanding on this lecture will be confirmed.					
[Class requirement]					
None					
[Method, Point of view, and Attainment levels of Evaluation]					
Reports and examination					
[Textbook]					
Instructed during class					
[Reference books, etc.]					
(Reference books)					
[Regarding studies out of class (preparation and review)]					
After lectures, solve the problems in the print.					
(Others (office hour, etc.))					
*Please visit KULASIS to find out about office hours.					

計算機工学(2)	
[Reference books, etc.]	
(Reference books) David Patterson and John Hennessy 著 Computer Organization and Design: The Hardware/Software Interface	
(Related URLs) (Materials are provided through KULASIS. https://www.k.kyoto-u.ac.jp/student/)	
[Regarding studies out of class (preparation and review)]	
Short quiz will be given as a homework at the end of the classes, which covers some of the key topics discussed in the lecture. Students are asked to solve them and submit by the next class. Through solving problems, students should try to deepen the understanding of the design concepts and the mechanisms of the computers.	
(Others (office hour, etc.))	
This syllabus is subject to change. Any changes to the syllabus shall be distributed in writing, which may include electronic communication. *Please visit KULASIS to find out about office hours.	

Numbering code					
Course title <English>	自動制御工学 Control Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Associate Professor,EBIHARA YOSHIO		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Tue.1	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[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 Schedule and Contents]					
Feedback systems and the Laplace transformation (4--5 weeks)					
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 weeks)					
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 weeks)					
Transient responses of systems and algebraic stability criteria of feedback systems.					
Frequency responses (4--5 weeks)					
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.					
----- Continue to 自動制御工学(2)					

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自動制御工学(2)	
[Class requirement]	
Theory of functions in complex variables, as well as basic understanding about complex numbers.	
[Method, Point of view, and Attainment levels of Evaluation]	
The assignments are only for motivating review; the grading will be based on the exam.	
[Textbook]	
荒木光彦 『古典制御理論(基礎編)』(培風館) ISBN:4563069019	
[Reference books, etc.]	
(Reference books)	
(Related URLs)	
((from within the university) http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/AC/)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.))	
The contents of the lecture and their order are subject to changes depending on the situation each year.	
*Please visit KULASIS to find out about office hours.	

デジタル制御(2)	
[Class requirement]	
Control Engineering; Exercise of Computer Programming in Electrical and Electronic Engineering (basic understanding about programming)	
[Method, Point of view, and Attainment levels of Evaluation]	
The assignments are only for motivating review; the grading will be based on the exam.	
[Textbook]	
荒木光彦 『デジタル制御理論入門』(朝倉書店) ISBN:4254209649	
[Reference books, etc.]	
(Reference books)	
(Related URLs)	
((from within the university) http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/DC/)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.))	
The contents of the lecture and their order are subject to changes depending on the situation each year.	
*Please visit KULASIS to find out about office hours.	

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Numbering code	
Course title <English>	デジタル制御 Digital Control
Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Associate Professor,EBIHARA YOSHIO
Target year	3rd year students or above
Number of credits	2
Course offered year/period	2019/Second semester
Day/period	Tue.4
Class style	Lecture
Language	Japanese
[Outline and Purpose of the Course]	
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.	
[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 Schedule and Contents]	
Fundamentals of digital control and the z-transformation (4--5 weeks)	
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 weeks)	
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 weeks)	
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.	
Continue to デジタル制御(2)	

Numbering code	
Course title <English>	放電工学 Electric Discharge and Breakdown
Affiliated department, Job title,Name	Part-time Lecturer, Part-time Lecturer,YAMAMOTO OSAMU Part-time Lecturer,USHIO TOMOO
Target year	3rd year students or above
Number of credits	2
Course offered year/period	2019/Second semester
Day/period	Tue.5
Class style	Lecture
Language	Japanese
[Outline and Purpose of the Course]	
This course focuses on explaining the phenomena of electrical discharges and breakdowns in gases, as well as the mechanisms behind them, especially basic processes in ionized gases such as collision phenomena, the process of excitation/ionization, and transport phenomena; discharge ionization theory and Paschen ' s law; and forms of electrical discharge such as corona, glow, and arcing.	
[Course Goals]	
Gain a deep understanding of basic electrical discharge processes and discharge maintenance mechanisms, essential knowledge for those engaged in electrical and electronic engineering, and build sufficiently profound comprehension of the basic characteristics of different types of discharge and engineering application fields.	
[Course Schedule and Contents]	
"1. Electric discharge in gas and its role in engineering (1 class) Provide an overview of the phenomenon of electric discharge in gas, and describe the intentions of the course.	
2. Basic processes in ionized gases (4 classes) Explain basic processes in ionized gases, such as the phenomenon of collision between gaseous molecules, the process of excitation/ionization, transport phenomena, and recombination phenomena.	
3. Initiation of electric discharge in gas (3 classes) Explain the phenomenon of electron avalanche when an electric field is applied to a gas, and describe the mechanism of initiation of electric discharge in a gas as well as Paschen ' s law. Also, explain streamer theory.	
4. Steady gaseous discharge (6 classes) Explain the various types of discharge following the initiation of discharge. Describe in detail discharge phenomena such as corona discharge, long air gap discharge, glow discharge, and arc discharge. Also, explain technologies using each type of discharge. Confirmation of learning attainment, 1 class: Confirm the degree of learning attained in the course overall.	
5. Confirmation of learning attainment (1 class): Confirm the degree of learning attained in the course overall."	
Continue to 放電工学(2)	

放電工学(2)
[Class requirement] Basic knowledge of the physics of gases is sufficient.
[Method, Point of view, and Attainment levels of Evaluation] Grade is based on the results of regular examinations. Attendance and quiz results may be considered.
[Textbook] Not used
[Reference books, etc.] (Reference books) 電気学会 『電離気体論』 ISBN:4886861067 オーム社 『高電圧工学』 ISBN:4274214448
[Regarding studies out of class (preparation and review)] Discussed as appropriate.
(Others (office hour, etc.)) *Please visit KULASIS to find out about office hours.

通信基礎論(2)
[Class requirement] Students are required to have taken the course Industrial Mathematics (Fourier Analysis) and Electronic Circuits.
[Method, Point of view, and Attainment levels of Evaluation] Evaluation is made of extent of student's understanding of course contents via written examination.
[Textbook] 守倉他 『通信方式』 (オーム社) ISBN:9784274214738
[Reference books, etc.] (Reference books) 寺田他: 情報通信工学 (オーム社) isbn {} {4274129322}
[Regarding studies out of class (preparation and review)] Students are required to have taken the course Industrial Mathematics (Fourier Analysis) and Electronic Circuits.
(Others (office hour, etc.)) After classes, from 10:30-12:00 *Please visit KULASIS to find out about office hours.

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Numbering code			
Course title <English>	通信基礎論 Modulation Theory in Electrical Communication	Affiliated department, Job title, Name	Graduate School of Informatics Professor.MORIKURA MASAHIRO Graduate School of Informatics Associate Professor.MURATA HIDEKAZU
Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/First semester		
Day/period	Wed.1	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
This course discusses all types of modulation methods, that is, the theories of amplitude, frequency, phase, pulse modulations, as well as the principles of modulation/demodulation. Further focus is made on signal processing basics, sampling theory, etc., including of related applications.			
[Course Goals]			
Students will gain an understanding of the fundamentals of communication theory, used in mobile telephones, wireless local area networks (LAN), optical fiber communications, etc. Specifically, students will master signal expression and signal processing (modulation/demodulation) within time axis and frequency axis of communication signals, chiefly in the physical layers of communication signals.			
[Course Schedule and Contents]			
"Signal processing (4-5 classes) Clarification is made of the concept of " frequency, " and students learn of tools for handling frequency, namely, Fourier series and Fourier transforms and their practical applications. Discussion is next made especially of the basics of random signals and theories regarding the standardization and quantization of random signals.			
Analog modulation and demodulation methods (5-6 classes) Discussion is made of the principles of amplitude modulation and angle modulation and their generation and modulation methods, with comparison of their respective characteristics, including occupied bandwidth and signal-to-noise ratio, etc.			
Digital modulation and demodulation methods (4-5 classes) After description of various methods of pulse modulation, there is discussion of principles and methods of digital modulation types, including modulation phase shift keying (PSK), etc., plus the basics of signal space. Confirmation is made of the extent of student understanding, with supplementary discussion to further improve levels of understanding.			
Confirmation of extent of student learning (1 class) Confirmation is made of the extent that students have learned the contents of this course. Additional explanation is provided for those students whose understanding remains incomplete or imperfect.			
Continue to		通信基礎論(2)	

Numbering code			
Course title <English>	情報伝送工学 Information Transmission	Affiliated department, Job title, Name	Graduate School of Informatics Associate Professor.MURATA HIDEKAZU Graduate School of Informatics Associate Professor.YAMAMOTO KOUJI
Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Second semester		
Day/period	Wed.2	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
We will introduce mobile cellular systems, wireless LANs, Ethernet, optical disks, etc. as specific applications of information transmission. We also discuss issues in the design of each system and their solutions.			
[Course Goals]			
Students will gain an understanding of fundamental concepts involving highly reliable information transmissions via communication channels with noise and interference.			
[Course Schedule and Contents]			
(1) Communication systems (3 weeks) Lectures discuss general configurations for communication systems and wireless communication systems, as well as link budget and channel capacity.			
(2) Optical disks and Ethernets (2 weeks) Discussions are made of pulse-code modulation (PCM) and baseband transmission required for understanding optical disks and Ethernets.			
(3) Multiple access for wireless systems (2 weeks) Discussions are made of multiplexing, multiple access, channel allocation, and user scheduling, which are necessary for mobile cellular systems and wireless LANs.			
(4) Cellular systems (1 week) We describe the cellular system that realizes wide area public wireless service and introduce the concept of clusters and handovers.			
(5) Fading, and countermeasure techniques (1 week) We introduce a typical model of fading in urban areas and countermeasure techniques, including diversity, etc.			
(6) High-speed and high-efficiency technologies (3 weeks) We introduce equalization and orthogonal frequency division multiplexing (OFDM) as high-speed technologies and adaptive modulation and multiple-input and multiple-output (MIMO) as spectral efficient technologies.			
(7) Transmission techniques for wireless systems (2 weeks) Basic transmission technologies used for mobile cellular systems and wires LANs will be explained.			
(8) Confirmation of extent of student learning (1 week)			
Continue to		情報伝送工学(2)	

情報伝送工学(2)	
Confirmation (i.e., evaluation) is made of the extent that students understand the concepts involved in highly reliable information transmissions.	
[Class requirement] Students are recommended to have taken "Modulation Theory in Electrical Communication".	
[Method, Point of view, and Attainment levels of Evaluation]	
【Evaluation method】 Written examination (up to 100 points), reports or exercises (total of 1 or 2 times, maximum of 5 points each) are carried out, and the total points (up to 100 points) are evaluated.	
【Evaluation criteria】 Evaluation is based on the achievement level of the target.	
[Textbook] 守倉正博 『OHM大学テキスト 通信方式』(オーム社) ISBN:9784274214738	
[Reference books, etc.] (Reference books) 鈴木博 『デジタル通信の基礎』(数理工学社) ISBN:9784901683845	
[Regarding studies out of class (preparation and review)] Portions of this course involve explanations of applications of "Modulation Theory in Electrical Communication". Students must review these by discovering for themselves the relationships between those applications and "Modulation Theory in Electrical Communication".	
(Others (office hour, etc.)) Portions of course contents may be omitted, or additions may be made when necessary. *Please visit KULASIS to find out about office hours.	

Numbering code		Course title <English> マイクロ波工学 Microwave Engineering		Affiliated department, Job title,Name		Research Institute for Sustainable Humanosphere Professor,SHINOHARA NAOKI Research Institute for Sustainable Humanosphere Associate Professor,MITANI TOMOHIKO	
Target year	4th year students or above	Number of credits	2	Course offered year/period	2019/First semester		
Day/period	Tue.2	Class style	Lecture	Language	Japanese		
[Outline and Purpose of the Course] Theory and applications of microwave transmission line, microwave passive circuits, active circuits, and microwave tubes are given. Applications of their devices and elements for mobile phones, radar and wireless power transmission are given.							
[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 Schedule and Contents] General concepts,1-2times,After confirmation of Maxwell's equations and wave guide theory, general concepts of microwave engineering are presented as introduction of the following theme. Circuit theory of transmission line,2-3times,Characteristics of microwave transmission line and circuit theory of transmission line are given. Impedance matching and Smith Chart are given. Microwave passive circuits,2-3times,Connector, circuit device in waveguide, impedance matching load, attenuator, phase shifter, T-blanch, isolator, circulator, directional coupler, power divider/combiner are given. Microwave resonator and filter,2-3times,Microwave resonator and filter are given. Microwave tubes,1-2times,Generation/amplifier mechanism of microwave tubes of Klystron, TWT, magnetron are given. Microwave active circuits and semiconductor devices,2-3times,Diode as microwave passive semiconductor and FET and HBT as microwave active semiconductors are given. Its applications like Parametric amplifier are given. Microwave Applications,3-4times,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,1time,Student's understanding of this lecture is confirmed. Opportunity of feed-back lecture is given if the student's understanding is not enough.							
[Class requirement] Radio Engineering, Maxwell's equations, theory of radio waves, electric circuits, Distributed parameter circuits							
[Method, Point of view, and Attainment levels of Evaluation] Grading will be done with the result of the final report and several reports in lectures.							
[Textbook] Masamitsu Nakajima 『Microwave Engineering (in Japanese)』(Morikita Publishing) ISBN: 9784627710306							
Continue to マイクロ波工学(2)							

Numbering code		Course title <English> 通信ネットワーク Telecommunication Networks		Affiliated department, Job title,Name		Graduate School of Informatics Professor,Okie Eiji Graduate School of Informatics Associate Professor,SHINKUMA RIYOUICHI Part-time Lecturer,IWASAKI SHIGERU Part-time Lecturer.	
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/Second semester		
Day/period	Mon.2	Class style	Lecture	Language	Japanese		
[Outline and Purpose of the Course]							
[Course Goals]							
[Course Schedule and Contents] .3times, .3times, .3times, .2times, .3times, .1time,							
[Class requirement] None							
[Method, Point of view, and Attainment levels of Evaluation]							
[Textbook]							
[Reference books, etc.] (Reference books)							
[Regarding studies out of class (preparation and review)]							
(Others (office hour, etc.)) *Please visit KULASIS to find out about office hours.							

マイクロ波工学(2)	
Confirmation (i.e., evaluation) is made of the extent that students understand the concepts involved in highly reliable information transmissions.	
[Reference books, etc.] (Reference books) Toshio Nojima and Yasushi Yamao 『RF Circuit Technologies for Mobile Communication (in Japanese)』(IEICE) ISBN:9784885522222 Yoshihiro Konishi 『Theory and Applications of Microwave Circuits (in Japanese)』(Sogo Denshi Publishing) ISBN:4915449599	
[Regarding studies out of class (preparation and review)] A student should read text book before/after class.	
(Others (office hour, etc.)) *Please visit KULASIS to find out about office hours.	

Numbering code					
Course title <English>	計算機ソフトウェア Computer Software		Affiliated department, Job title, Name	Graduate School of Informatics Professor.KUROHASHI SADA0	
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Tue.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
This course explains the basic data structure and various algorithms which are indispensable for the creation of various computer programs.					
[Course Goals]					
This course aims to understand the basic computer program and design it soundly by mastering the data structure and various algorithms and programming techniques.					
[Course Schedule and Contents]					
[1 week] Algorithm and complexity What the algorithm is and how to measure the goodness of the algorithm. [3 weeks] Various data structures and algorithms List and heap as a basic data structure, and basic algorithms for those structures. [3 weeks] recursive call and split rule How to divide and solve complex problems into simpler smaller problems. [3 weeks] Graph search The graph structure and its search algorithm. [2 weeks] Dynamic programming The principle of optimality and dynamic programming. [2 weeks] How to measure and cope with difficulty of problems How to measure the difficulty of the problem itself, how to cope with difficult problems, public key cryptosystem using difficult problems. [1 week] Confirmation of learning achievement Review the achievement on the contents of this lecture.					
[Class requirement]					
It is required to take basic information processing, basic information processing exercises, exercise of computer programming in EE engineering (60620), and computer architecture basics (60160).					
[Method, Point of view, and Attainment levels of Evaluation]					
Evaluation will be based on assignments and an examination.					
----- Continue to 計算機ソフトウェア(2)					

Numbering code					
Course title <English>	固体電子工学 Solid-State Electronics		Affiliated department, Job title, Name	Graduate School of Engineering Professor,NODA SUSUMU Graduate School of Engineering Associate Professor,ASANO TAKASHI	
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Wed.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[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 Schedule and Contents]					
Overview of solid-state electronics,1time,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?2times,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,4times,We will explain the mechanism of photon absorption in solid state and derive some equations to express the absorption quantitatively. Amplification of light,2?3times,We will explain the mechanism of optical amplification and derive some quantitative equations. Various photonic devices,3?4times,Various photonic devices based on the above discussions are given, such as solar cells, semiconductor lasers, etc. Verification of understanding,1time,We confirm whether the students can understand the above subjects.					
[Class requirement]					
It is desirable to learn some related lectures such as semiconductors, fundamental of material and devices, etc.					
[Method, Point of view, and Attainment levels of Evaluation]					
Examination and submission of a few reports					
[Textbook]					
Note stile					
[Reference books, etc.]					
(Reference books) We will show some references during the lecture					
----- Continue to 固体電子工学(2)					

計算機ソフトウェア(2)	

[Textbook]	
杉原厚吉 『データ構造とアルゴリズム』 (共立出版) ISBN:4320120345	
[Reference books, etc.]	
(Reference books) Donald E.Knuth 『The Art of Computer Programming Volume 1 Fundamental Algorithms Third Edition 日本語版』 (ドワンゴ) ISBN:9784756144119	
[Regarding studies out of class (preparation and review)]	
Students should prepare and review the content of the lecture, focusing on exercise problems given in the lecture and assignments.	
(Others (office hour, etc.))	
For details of office hours, please check with KULASIS.	
*Please visit KULASIS to find out about office hours.	

固体電子工学(2)	

[Regarding studies out of class (preparation and review)]	

(Others (office hour, etc.))	
The numbers and order of course topics described above might be changed.	
*Please visit KULASIS to find out about office hours.	

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Numbering code							
Course title <English>	半導体工学 Semiconductor Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor.KIMOTO TSUNENOBU	Target year	2nd year students or above	Number of credits	2
Course offered year/period	2019/Second semester	Day/period	Tue.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]							
[Course Goals]							
[Course Schedule and Contents]							
Introduction to semiconductor engineering,1time, Semiconductor physics,4-5times,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,3-4times,metal/semiconductor interface, ohmic and Schottky contacts, space charge, current-voltage characteristics, capacitance-voltage characteristics, generation/recombination, pn junction Transistors,4-5times,bipolar transistors, MOSFETs Summary,1time,							
[Class requirement]							
None							
[Method, Point of view, and Attainment levels of Evaluation]							
[Textbook]							
Hiroyuki Matsunami: Handoutai kougaku (Shoukoudou) isbn{}{4785612002} isbn{}{4785611308}							
[Reference books, etc.]							
(Reference books)							
WILEY S. M. Sze, Kwok K. NG quotquotPhysics of Semiconductor Devicesquotquotisbn{}{9780471143239} isbn{}{9780470068304} .							
[Regarding studies out of class (preparation and review)]							
(Others (office hour, etc.))							
*Please visit KULASIS to find out about office hours.							

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Numbering code							
Course title <English>	電気電子材料学 Electrical and Electronic Materials	Affiliated department, Job title,Name	Graduate School of Engineering Professor.YAMADA HIROFUMI Graduate School of Engineering Associate Professor.KOBAYASHI KEI	Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Second semester	Day/period	Wed.3	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]							
[Course Goals]							
[Course Schedule and Contents]							
,1time, ,4times, ,2times, ,2times, ,3times, ,2times, ,1time,							
[Class requirement]							
None							
[Method, Point of view, and Attainment levels of Evaluation]							
[Textbook]							
[Reference books, etc.]							
(Reference books)							
[Regarding studies out of class (preparation and review)]							
(Others (office hour, etc.))							
*Please visit KULASIS to find out about office hours.							

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Numbering code							
Course title <English>	プラズマ工学 Plasma Engineering	Affiliated department, Job title,Name	Part-time Lecturer,SAKAI OSAMU Research Institute for Sustainable Humanosphere Associate Professor.EBIHARA YUUSUKE	Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Second semester	Day/period	Thu.5	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]							
[Course Goals]							
[Course Schedule and Contents]							
,1time, ,2-3times, ,6-8times, ,3-4times, ,1time,							
[Class requirement]							
None							
[Method, Point of view, and Attainment levels of Evaluation]							
[Textbook]							
[Reference books, etc.]							
(Reference books)							
[Regarding studies out of class (preparation and review)]							
(Others (office hour, etc.))							
*Please visit KULASIS to find out about office hours.							

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Numbering code							
Course title <English>	光工学 1 Fundamentals of Optical Engineering 1	Affiliated department, Job title,Name	Graduate School of Engineering Professor,KAWAKAMI YOUICHI Graduate School of Engineering Associate Professor,FUNATO MITSURU	Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Second semester	Day/period	Tue.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]							
[Course Goals]							
[Course Schedule and Contents]							
,1time, ,2-3times, ,3-4times, ,3-4times, ,3-4times, ,1time,							
[Class requirement]							
None							
[Method, Point of view, and Attainment levels of Evaluation]							
[Textbook]							
[Reference books, etc.]							
(Reference books)							
[Regarding studies out of class (preparation and review)]							
(Others (office hour, etc.))							
*Please visit KULASIS to find out about office hours.							

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Numbering code			
Course title <English>	光通信工学 Optical Communications	Affiliated department, Job title, Name	Graduate School of Informatics Professor, Oki Eiji
Target year	4th year students or above	Number of credits	2
Course offered year/period	2019/First semester		
Day/period	Thu.1	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
This course describes optical fiber communication. Optical networks that use optical communication system are explained. After the course explains optical characteristics and optical transmission, it explains signal propagation in optical fibers, optical signal sources, optical amplifiers, optical elements, and optical modulation and demodulation, considering the differences from conventional electronic communications. Then, the course explains optical networks that adopts optical consumption systems.			
[Course Goals]			
This course aims to help students to acquire the features of optical communications in comparison with those of electrical communications.			
[Course Schedule and Contents]			
Overview, 1 time, progress and present status of optical communications are described as the introduction of the course. Optical characteristics and optical transmission, 2 times. Signal propagation in optical fibers, 2 times. Optical signal sources, 1-2 times. Optical amplifiers, 2 times. Optical elements, 2 times. Optical modulation and demodulation, 1-2 times. Optical networks, 2-3 times. Feedback, 1 time.			
[Class requirement]			
Modulation Theory in Electrical Communication (60320) , Information Transmission (60330) , Fundamentals of Optical Engineering 1(60440)			
[Method, Point of view, and Attainment levels of Evaluation]			
Evaluation will be based on one final examination.			
[Textbook]			
Not used			
[Reference books, etc.]			
(Reference books) Murakami Yasuji: Introduction to Fiber Optic Communication (Corona Publishing), isbn{}{}			
		Continue to 光通信工学(2)	

Numbering code			
Course title <English>	光電子デバイス工学 Optoelectronic Devices	Affiliated department, Job title, Name	Graduate School of Engineering Professor, NODA SUSUMU Graduate School of Engineering Associate Professor, ASANO TAKASHI
Target year	4th year students or above	Number of credits	2
Course offered year/period	2019/First semester		
Day/period	Mon.4	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
As the foundation for solid-state electronic engineering and semiconductor engineering to be taken by third-year students, detailed discussion is made of the theory of operations of various types of optical and electronic devices. Detailed explanation begins with the fundamentals of operations theory in optical devices.			
[Course Goals]			
Students will understand the physical background of spontaneous emission processes, as well as various elements essential when considering spontaneous emission processes in semiconductors.			
[Course Schedule and Contents]			
Basic light emission processes (4-5 classes) An overview is made of spontaneous emission processes in two-level electron systems. Explanation is then made of Fermi ' s golden rule, electric dipole interactions, density of light (photon) states, etc. Finally, theoretical expression of the light-emitting relaxation rate is derived. Light emission processes from semiconductors (4-5 classes) An overview is presented of the processes from energy input to a semiconductor, to light emission. Next, the physics of light-emitting devices are explained. Using electron-hole state density and distribution functions, etc., theoretical formulas of emission spectra in the steady state are derived. Rate equations describing the transient state are also derived, with explanation of the elements that determine luminous efficiency. Control of electron state and emission characteristics (4-5 classes) Light-emission characteristics can be controlled via control of the electron states of a semiconductor light-emitting device. Explanation especially focuses on methods of improving emission characteristics by using quantum structure. Various quantum structures using semiconductor heterostructure are discussed. Explanation is also made of methods of calculating quantization level and of electron devices that use quantum structure. Confirmation of extent of student learning (1 class) Confirmation is made of the extent of student learning.			
		Continue to 光電子デバイス工学(2)	

光通信工学(2)	

9784339007602 Hideki Ishio: Optical Communication (Maruzen), isbn{}{9784621081082} Shinji Yamashita: Guide book for Optical Communication (Gijutsu-Hyohron Co.) isbn{}{4774114367} Yasuharu Suematu and Kenichi Iga: Introduction to Optical Fiber Communication (4th Edition) (Ohmsha) isbn{}{4274201988}	
[Regarding studies out of class (preparation and review)]	
Review after class.	
(Others (office hour, etc.))	
Questions can be answered after class. Otherwise, make an appointment by email. For detail office hours, ckeck KULASIS. *Please visit KULASIS to find out about office hours.	

光電子デバイス工学(2)	

[Class requirement]	
It is desirable that students be taking, or have taken already, solid-state electronic engineering and semiconductor engineering courses.	
[Method, Point of view, and Attainment levels of Evaluation]	
Reports (1 or 2 times) and tests.	
[Textbook]	
The lecture notes format is used in this course.	
[Reference books, etc.]	
(Reference books) Takashi Kushida 『Optical Properties and Spectroscopy of Solids』 (Asakura Publishing) ISBN: 4254130511 (in Japanese) Other reference books will be introduced during the course.	
[Regarding studies out of class (preparation and review)]	
Nothing of note.	
(Others (office hour, etc.))	
Changes may be made in the order of course classes and/or in the time allocated for each topic. *Please visit KULASIS to find out about office hours.	

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Numbering code					
Course title <English>	光工学 2 Fundamentals of Optical Engineering 2			Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor,FUNATO MITSURU Graduate School of Engineering Professor.KAWAKAMI YUICHI
Target year	4th year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Mon.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
[Course Goals]					
[Course Schedule and Contents]					
,1time, ,3-4times, ,5-6times, ,3-4times, ,1time, ,1time,					
[Class requirement]					
None					
[Method, Point of view, and Attainment levels of Evaluation]					
[Textbook]					
[Reference books, etc.]					
(Reference books)					
[Regarding studies out of class (preparation and review)]					
Will be discussed as needed.					
(Others (office hour, etc.))					
*Please visit KULASIS to find out about office hours.					

電気法規(2)					

Confirm the degree of learning attained with regard to the course overall."					
[Class requirement]					
Basic information concerning electricity generation, electricity transmission, electricity transformation, and electricity distribution.					
[Method, Point of view, and Attainment levels of Evaluation]					
Grade is based on the number of classes attended and score on the examination (administered at the final class meeting).					
[Textbook]					
In addition, printouts					
[Reference books, etc.]					
(Reference books)					
[Regarding studies out of class (preparation and review)]					
Will be discussed as needed.					
(Others (office hour, etc.))					
*Please visit KULASIS to find out about office hours.					

Numbering code					
Course title <English>	電気法規 Laws and Regulations of Electric Power Engineering			Affiliated department, Job title,Name	Part-time Lecturer,NISHIDA ATSUSHI
Target year	4th year students or above	Number of credits	2	Course offered year/period	2019/Intensive, First semester
Day/period	Intensive	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
This course discusses the main thrust of electricity-related laws and ordinances, explaining their relationship with energy, environmental problems, and so on, with a focus on the Electric Utility Industry Law.					
[Course Goals]					
By learning about laws concerning the electricity business, learn details on regulation of energy supply technologies and their safety, and gain the knowledge needed to be certified as an energy supply technician.					
[Course Schedule and Contents]					
"1. History of the electricity business and law/electrical equipment technical standards (1 class)					
Explain the history of the electricity business and its relationship to various laws and ordinances, the role the electricity business has played, electrical safety, changes in electrical equipment technical standards, the content of regulations, their legal positioning, and so on.					
2. Quality of electric power (2 classes)					
Explain the quality of electric power and related laws and ordinances, referencing trends in electric power technologies. Also, to accurately understand present conditions in the electricity business and the quality of electric power, take a field trip to an electric power facility.					
3. Electric power system applications (1 class)					
Explain the electric power system and supply-demand management. Also, discuss the role of electric supply facilities and disaster rehabilitation measures, including a field trip to a facility.					
4. Electric power liberalization and nuclear energy (1 class)					
Explain challenges related to the electricity business, the trend toward deregulation and liberalization of electric power, and the current state of affairs of nuclear power generation.					
5. The global environment and energy conservation/alternative energy (1 class)					
Explain global environmental issues such as global warming, as well as electricity business initiatives aiming to achieve a low-carbon society, such as alternative energy, smart grids, and energy conservation.					
6. Confirmation of learning attainment (1 class)					

Continue to 電気法規(2)					

Numbering code					
Course title <English>	電波法規 Laws and Regulations of Radio Wave Engineering			Affiliated department, Job title,Name	Research Institute for Sustainable Humanosphere Professor,SHINOHARA NAOKI Part-time Lecturer,ASAIMASAMITSU
Target year	4th year students or above	Number of credits	2	Course offered year/period	2019/Intensive, Second semester
Day/period	Intensive	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
In recent years, radio wave technology such as satellite communication, cellular phones, wireless LAN, and so on has been remarkably developed. In postwar Japan, radio wave administration is promoted mainly on the basis of the Radio Law and the Broadcast Act. In particular, the Radio Law, which aims to promote public welfare by ensuring the fair and efficient utilization of radio waves (Article 1), fulfills a key role in a society that uses radio waves. This course discusses the establishment of radio wave legislation and basic matters on the Radio Law and its related laws and regulations. This is a required course for those wishing to obtain qualification as the First Class On-The Ground Special Radio Operator or the Third Class Maritime Special Radio Operator.					
[Course Goals]					
The purpose of this course is to gain an understanding of basic matters concerning the establishment of Japanese radio wave legislation and laws and regulations related to radio waves.					
[Course Schedule and Contents]					
Overview of the Radio Law, 1 class: Discuss the foundational principles of the Radio Law, the structure of its provisions, its subjects of regulation, its relationship with international laws, as well as other laws and ordinances, definitions of terms, classification of radio stations, and so on. History of radio wave legislation, 1 class: Discuss the history of radio wave legislation beginning in the dawn of radio wave technology, postwar history of the Radio Law, the Broadcast Act, and the Act for Establishment of Radio Regulatory Commission. Basic matters on the Radio Law, 10 classes: Licensing and registration of radio stations, reasons for disqualification, licensing procedures, blanket licensing, etc.; Radio operator qualification, radio operator in charge; Technical regulations of radio equipment, Technical Regulations Conformity Certification, Model Examination of Radio Equipment etc. ; Basic principles of radio station operation, retained documents, etc., communication methods, etc.; Supervision, inspection of radio stations, radio propagation blockage prevented area, radio wave usage fees; Overview of related laws and regulations. On recent law amendments, 1 class: Explain major recent amendments. Actual operation of radio stations, 2 classes: Explain the actual examples of radio stations such as experimental stations and their related regulations.					
[Class requirement]					
None					

Continue to 電波法規(2)					

電波法規(2)
[Method, Point of view, and Attainment levels of Evaluation]
Attendance in class is required to pass, and grading is based on the results of in-class quizzes.
[Textbook]
Materials will be distributed.
[Reference books, etc.]
(Reference books) Shimei Imaizumi 『Radio Law Summary (in Japanese)』 (Denki Tsushin Shinko-kai) ISBN: 9784807607693
[Regarding studies out of class (preparation and review)]
No need.
(Others (office hour, etc.))
*Please visit KULASIS to find out about office hours.

デジタル回路(2)
Circuit configuration of ROM and RAM will be explained.
(8) Confirmation of understanding [1 week] The level of understanding on this lecture will be confirmed. Feedback will be given if necessary.
[Class requirement]
Semiconductor Engineering, Logic Circuits, Electronic Circuits
[Method, Point of view, and Attainment levels of Evaluation]
The level of achievement toward the goal of this lecture will be examined by a regular exam.
[Textbook]
Hand-outs will be provided.
[Reference books, etc.]
(Reference books) Introduced during class
[Regarding studies out of class (preparation and review)]
Plactices in the handout should be placed after the corresponding topic is covered by the lecture.
(Others (office hour, etc.))
*Please visit KULASIS to find out about office hours.

Numbering code					
Course title <English>	デジタル回路 Digital Circuits			Affiliated department, Job title, Name	Graduate School of Informatics Professor, ONODERA HIDETOSHI
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Thu.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
From this lecture you can understand basic properties of digital signals and linearized circuits. To understand operating principles, circuit performance, and design method of logic gates and memories.					
[Course Schedule and Contents]					
Following topics will be covered. By assessing the understanding of the students and adding explanations and tasks when necessary, we will spend the number of weeks listed in [].					
(1) Basic properties of digital signals [2 weeks] Frequency spectrum of digital signals and step response of linearized ircuit will be explained.					
(2) Transmission of digital signals [2 weeks] Signal transfer characteristics of loss-less transmission lines will be explained. Lossy transmission lines will also be covered.					
(3) Switching characteristics of semiconductor devices [3 weeks] DC and transient characteristics of pn junction diodes, bipolar transistors, MOS transistors will be explained.					
(4) Waveform shaping of digital signals [1 week] Waveform shaping circuits such as a clipper, limiter, and Schmitt-trigger circuits will be explained.					
(5) Bipolar digital circuits [2 weeks] 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.					
(6) MOS digital circuits [3 weeks] 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.					
(7) MOS memory circuits [1 week]					
Continue to デジタル回路(2)					

Numbering code					
Course title <English>	デジタル信号処理 Digital Signal Processing			Affiliated department, Job title, Name	Graduate School of Informatics Professor, NISHINO KO Graduate School of Informatics Associate Professor, NOBUHARA SHOUHEI
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Mon.4	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
The goal of this lecture is to understand fundamental theories and filter designs for one-dimensional time-domain signal and two-dimensional image processing and encoding. In particular, this course provides introductions to orthogonal transformation such as discrete Fourier transform, fast Fourier transform algorithms, one-dimensional and two-dimensional signal encoding methods including basics of JPEG / MPEG, and FIR and IIR filters based on the discrete-time linear time invariant system theory					
[Course Goals]					
Digital signal processing requires both theoretical analysis / design and practical software system implementations. This course provides exercises on signal processing in Python, with guidance by teaching assistants, and additional resources via the course web site. Short questions and answers are also provided to help understand the theories and implementations.					
[Course Schedule and Contents]					
Overview of digital signal processing (2 classes) * Introduction of the goal of digital signal processing, its essential ideas and advantages. * Extension of 1D Fourier transform to 2D or multi-dimensional signals and its applications in computed tomography (CT).					
Sampling and quantization (1 class) * Sampling theories in 1D signals and digitization process of 2D images.					
Discrete Fourier transform and FFT (3 classes) * Discrete Fourier transform in 1D signals. * Fast Fourier transform and its extension to 2D image signals.					
Orthogonal transformation and short-time Fourier transform (3 classes) * Discrete cosine transform and digital signal processing based on orthogonal transformation. * Short-time Fourier transform. * Multi-scale signal analysis and its extension to wavelet transform.					
Encoding (2 classes) * Waveform coding, vector quantization, and transform coding. * Media encoding for audio, document images, images (JPEG) and videos (MPEG).					
Filtering based on discrete-time systems (3 classes) * Discrete-time linear time-invariant system and z transform. * FIR and IIR filters * Basics on linear phase FIR filter and IIR filter design.					
Continue to デジタル信号処理(2)					

デジタル信号処理(2)	
* Filtering of 2D image signals.	
[Class requirement]	
Industrial Mathematics E1 (20540) and Fundamental Communication Theory (60320) are prerequisites for this course. Students should take Digital Control (60270) in parallel.	
[Method, Point of view, and Attainment levels of Evaluation]	
Grade evaluations will be based fundamentally on scores in the written final test. Evaluation will also be provided for the development of " non-trivial " digital processing software and reports on the functions, designs, performance evaluations, etc., of the software.	
[Textbook]	
Instructed during class	
[Reference books, etc.]	
(Reference books) Allen B. Downey 『Think DSP: Digital Signal Processing in Python』 (O'Reilly Media) ISBN:1491938455 (Online versions are available at http://greenteapress.com/wp/think-dsp/)	
(Related URLs) http://greenteapress.com/wp/think-dsp/ (An online version of "Think DSP")	
[Regarding studies out of class (preparation and review)]	
Students should improve programming skills in Python through digital signal processing exercises provided in the lecture.	
(Others (office hour, etc.)) Students should bring their own laptop for exercises in Python. *Please visit KULASIS to find out about office hours.	

電気電子プログラミング及演習(2)	
[Method, Point of view, and Attainment levels of Evaluation]	
(1) weekly reports, (2) a final project, and (3) an interview on the final project.	
[Textbook]	
Bohyou Shibata 『Meikai C Gengo Nyuumon-hen』 ISBN:9784797377026 (in Japanese)	
[Reference books, etc.]	
(Reference books) Chinese (ISBN: 9789862010426) and Korean (ISBN: 9788991767447) translations of the textbook are available.	
(Related URLs) https://panda.ecs.kyoto-u.ac.jp/Select "2019 Exercise of Computer Programming in Electrical and Electronic Engineering")	
[Regarding studies out of class (preparation and review)]	
The course can cover only the essential points in programming. Students are encouraged to study by themselves with the textbook.	
(Others (office hour, etc.)) *Please visit KULASIS to find out about office hours.	

Numbering code	
Course title <English>	電気電子プログラミング及演習 Exercise of Computer Programming in Electrical and Electronic Engineering
Affiliated department, Job title, Name	Graduate School of Informatics Professor, KUROHASHI SADA O Graduate School of Informatics Associate Professor, NOBUHARA SHOUHEI Graduate School of Informatics Associate Professor, NAKAO MEGUMI
Target year	2nd year students or above
Number of credits	2
Course offered year/period	2019/First semester
Day/period	Wed.4,5
Class style	Seminar
Language	Japanese
[Outline and Purpose of the Course]	
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.	
[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 Schedule and Contents]	
Introduction (1 class) Introduction of the importance and contributions of computer programming, followed by some instructions on weekly reports and a final project.	
Prerequisites of Programming (3 classes) 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 classes) Arrays, multi-dimensional arrays, functions, scopes, bit-operations, recursive calls.	
Advanced Programming (3 classes) Strings in C and their representations inside the computer, pointers, structures, file I/Os.	
Final Project (4 classes) A final project of this year.	
[Class requirement]	
"Exercises in Information Processing Basics" (basic skills on using UNIX-like systems) will be necessary.	
For weekly assignments and the final project, one will need to bring your own laptop PC (Windows, macOS, Linux) at every class. Students are encouraged to install the programming environment by following the instructions available at PandA before the 1st week of the course.	

Continue to 電気電子プログラミング及演習(2)

Numbering code	
Course title <English>	電気回路基礎論 Fundamentals of Circuit Theory
Affiliated department, Job title, Name	Graduate School of Engineering Associate Professor, HISAKADO TAKASHI
Target year	1st year students or above
Number of credits	2
Course offered year/period	2019/First semester
Day/period	Tue.5
Class style	Lecture
Language	Japanese
[Outline and Purpose of the Course]	
The course introduces the fundamentals of the electric circuit. Topics covered include: resistive elements and networks; independent sources; switches and dynamics of first- and second-order networks; phasor analysis; 2-port circuits.	
[Course Goals]	
Students are expected to learn the transient analysis by differential equation and steady state analysis by phasor.	
[Course Schedule and Contents]	
DC circuit, 3times, We introduce Kirchhoff's current law and Kirchhoff's voltage law, Ohm's law and independent sources. Differential equation of circuit, 5times, We introduce inductors and capacitors and explain the differential equation of circuit. AC circuit, 4times, We introduce phasor and explain the steady state analysis. two-port circuit, 2times, We extend one-port elements to two-port circuits. academic achievement test, 1time, The level of understanding on this lecture will be confirmed.	
[Class requirement]	
None	
[Method, Point of view, and Attainment levels of Evaluation]	
Reports and examinations	
[Textbook]	
奥村浩士 『エース電気回路理論入門』 (朝倉書店) ISBN:4254227469	
[Reference books, etc.]	
(Reference books)	
[Regarding studies out of class (preparation and review)]	
After the lesson, solve problems in the text.	
(Others (office hour, etc.)) *Please visit KULASIS to find out about office hours.	

Numbering code					
Course title <English>	システム最適化 System Optimization	Affiliated department, Job title, Name	Part-time Lecturer, FURUTANI EIKOU		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Tue.3	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
To understand fundamentals of linear programming and nonlinear programming: the simplex method, duality, locally and globally optimal solutions, convex space and convex functions, optimality conditions and basic solution methods for nonlinear programming problems.					
[Course Schedule and Contents]					
Optimization problems, 1time, optimality, overview and classification of optimization problems, mathematical preliminary Linear programming and simplex method, 7-8times, 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, 1time, 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, 2-3times, 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, 2-3times, optimality conditions for nonlinear programming problems with constraints, Lagrange function, Lagrange multiplier method, duality, saddle point theorem, penalty function method, multiplier method, and sequential quadratic programming method Review, 1time, The level of understanding on this lecture will be confirmed.					
[Class requirement]					
linear algebra and analytics					
[Method, Point of view, and Attainment levels of Evaluation]					
The assignments are only for understanding; the rating will be based on an exam.					
Continue to システム最適化(2)					

Numbering code					
Course title <English>	知能型システム論 Intelligent Systems	Affiliated department, Job title, Name	Graduate School of Informatics Professor, ISHII SHIN Institute for Liberal Arts and Sciences Professor, KITA HAJIME		
Target year	4th year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Wed.4	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
A variety of intelligent systems that model human intelligent behavior have been proposed. In this course, lectures discuss problem solving using state space searches, the branch-and-bound algorithm method, and other means of finding optimal solutions for complex problems. Lectures will also describe basic items and example applications of machine learning methods, which obtain various functions from examples, covering reinforcement learning, supervised learning and unsupervised learning.					
[Course Goals]					
The goals of this class are for students to gain basic knowledge of intelligent systems that model human intelligent behavior. A deeper understanding will be gained via student reports that will include programming elements.					
[Course Schedule and Contents]					
Problem solving using state-space searches (1 class) Many intelligent activities can be modeled as the process of an operator changing the state of a system until reaching a goal state. This lecture takes up simple examples and introduces state-space expression methods and search algorithms for different types of state-spaces. Tree searches (1 class) The state-space for problems involving decisions can be described using a tree. This lecture discusses method for making optimal decisions using state-space searches, as well as related issues and problems. The branch-and-bound method (1 class) The branch-and-bound (BB) method is a (meta) algorithm for conducting efficient searches to find solutions for optimizing evaluation functions under a variety of limiting conditions. This lecture discusses state-space searches in such frameworks. Game tree searches (1 class) In a game-like situation in which one is competing with an opponent, it is necessary for both sides to make state-space searches within a framework of making optimal choices. This lecture discusses state-space searches within such frameworks, as well as optimization of such searches. Overview of learning from examples/cases (1 class) Neural networks are a classical example of learning by gaining greater functionality from examples. This lecture lays the foundation for the ideas to be described in classes to follow, regarding reinforcement learning, supervised learning, and unsupervised learning. Dynamic programming and reinforcement learning (2 classes) "Reinforcement learning" is learning to attain behavior based on reward or punishment. Q-learning is a					
Continue to 知能型システム論(2)					

システム最適化(2)	
[Textbook]	
H. Tamaki (ed.): System Optimization (in Japanese), Ohm-sha, 2005 isbn{}{4274201627}.	
[Reference books, etc.]	
(Reference books)	
M. Fukushima: Introduction to Mathematical Programming (in Japanese), Asakura, 1996 isbn{}{9784254209754} isbn{}{9784254280043}.	
(Related URLs)	
(http://turbine.kuee.kyoto-u.ac.jp/~furutani/system-optimization/)	
[Regarding studies out of class (preparation and review)]	
Will be discussed as needed.	
(Others (office hour, etc.))	
The contents of the lecture and their order are subject to changes depending on the situation each year.	
*Please visit KULASIS to find out about office hours.	

知能型システム論(2)	
[Textbook]	
reinforcement learning algorithm for attaining multi-stage behavior. Lectures focus on Q-learning, including its relationship to dynamic programming, an important technique for system optimization.	
[Reference books, etc.]	
(Reference books)	
Supervised learning (4 classes) Supervised learning involves learning from case example input-output relationships. Lectures start with the perceptron, the simplest model of supervised learning, and then take up the least-square method, which serves as the foundation of this learning, non-linear optimization using the gradient method, and more. These classes introduce multilayer perceptrons, which can learn complex input-output relationships, the back-propagation method for multilayer perceptrons, plus deep networks and deep learning, rapidly becoming widespread in recent years for a variety of applications. Support vector machines, extensions of linear discriminant analysis, are also introduced.	
[Regarding studies out of class (preparation and review)]	
Unsupervised learning and statistical estimation (4 classes) Unsupervised learning is learning from the distribution characteristics of examples, or by extracting characteristics from examples. These lectures discuss the basics of statistical estimation of probability models, a foundation of unsupervised learning, as well as applications including time series analysis, clustering, image processing, etc. Also introduced are methods based on Bayesian estimation.	
[Class requirement]	
Students must have a knowledge of computer software (60370) and system optimization (60660).	
[Method, Point of view, and Attainment levels of Evaluation]	
Comprehensive evaluations will be made of student understanding of the items shown in this class syllabus via considerations of the following: in-class exercises, reports that include programming, attendance (and class participation).	
[Textbook]	
Document copies will also be used.	
[Reference books, etc.]	
(Reference books)	
To be introduced as necessary.	
[Regarding studies out of class (preparation and review)]	
Students will be engaged in writing reports that include programming.	
(Others (office hour, etc.))	
Time will be set aside after each class period for student-teacher feedback.	
*Please visit KULASIS to find out about office hours.	

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Numbering code					
Course title <English>	パワーエレクトロニクス Power Electronics		Affiliated department, Job title,Name	Graduate School of Engineering Professor,HIKIHARA TAKASHI	
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Mon.1	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
Power Electronics is a field of power conversion and system control through applications of power semiconductor devices. In class, fundamental lectures include the basic of power conversion by switching circuit and circuit behavior in transient. The applications include the control methods of power sources and motors by conversion circuits.					
[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 converter.					
[Course Schedule and Contents]					
Outline of power electronics,4times,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,4times,The dynamic behavior and characteristics of Buck and Boost convertors are explained. ac/dc convertors,4times,Various conversion circuits are explained. Configurations of single phase and three phase circuits are lectured with the analysis of harmonic components of output. Applications of power electronics,2times,As the applications of power electronics, the motor drive by inverters are lectured. Summary,1time,The classes are summarized. This is the feedback to students according to their score.					
[Class requirement]					
Electric circuit, Electronic circuit, Power circuit, and Electric apparatus.					
[Method, Point of view, and Attainment levels of Evaluation]					
The final evaluation is decided based on examination with homeworks.					
[Textbook]					
Lecture notes will be posted at the web page.					
Continue to パワーエレクトロニクス(2)					

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Numbering code					
Course title <English>	電気電子工学概論 Introduction to Electrical and Electronic Engineering		Affiliated department, Job title,Name	Graduate School of Informatics Associate Professor,NAKAO MEGUMI Graduate School of Engineering Associate Professor,SUGIYAMA KAZUHIKO Institute of Advanced Energy Associate Professor,KADO SHINICHIRO Graduate School of Engineering Associate Professor.SAKAMOTO TAKUYA	
Target year	1st year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Wed.4,5	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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 the first time 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.					
[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 Schedule and Contents]					
Overview,1time,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 (No. 1),1time,Each team visits the assigned laboratory (No. 1) that belongs to the Electric and Electronic Engineering Course, and investigates the activities in the lab. Visiting of laboratories (No. 2),2times,Each team visits the assigned laboratory (No. 2) that belongs to the Electric and Electronic Engineering Course, and investigates the activities in the lab. Preparation of presentation,2times,The students prepare a poster presentation to introduce the activities in the laboratory (No. 2) that they visit and investigate. Presentation,1time,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.					
Continue to 電気電子工学概論(2)					

パワーエレクトロニクス(2)	
[Reference books, etc.]	
(Reference books) There are many supplemental texts. If students request their English version, please contact to the professor.	
(Related URLs) (Lecture data are offered on kulasis or Panda.)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.)) 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. *Please visit KULASIS to find out about office hours.	

電気電子工学概論(2)	
[Class requirement]	
None	
[Method, Point of view, and Attainment levels of Evaluation]	
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.	
[Textbook]	
The materials will be distributed.	
[Reference books, etc.]	
(Reference books)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.)) 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. *Please visit KULASIS to find out about office hours.	

Numbering code			
Course title <English>	電気電子計算工学及演習 Computational Methods and Exercise in Electrical and Electronic Engineering	Affiliated department, Job title, Name	Graduate School of Engineering Professor, AMEMIYA NAOYUKI Research Institute for Sustainable Humanosphere Associate Professor, EBIHARA YUUSUKE Institute for Information Management and Communication Associate Professor, AOKI TAKAAKI Graduate School of Informatics Assistant Professor, MURAWAKI YUGO
Target year	3rd year students or above	Number of credits	3
Course offered year/period		Course offered year/period	2019/Second semester
Day/period	Thu.1,2	Class style	Seminar
Language	Japanese		
[Outline and Purpose of the Course]			
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.			
[Course Goals]			
Students are expected to understand the fundamental concept as well as the background of numerical analyses in electrical and electronic engineering. They are expected to obtain programming skill and knowledge to carry out various numerical analyses.			
[Course Schedule and Contents]			
Numerical expression and errors in computer ,1?2 times, Solution of linear equation,2?3 times, Solution of nonlinear equation,2?3 times, Solution of eigenvalue problem,1~2times, Interpolation and numerical Integration,2?3 times, Solution of ordinal differential equation,2?3 times, Solution of partial differential equation,2?3times, Interview,1time,			
[Class requirement]			
Linear algebra precalculus			
[Method, Point of view, and Attainment levels of Evaluation]			
Grading will be made based on reports, interview, attendance to the class, and several quizzes.			
[Textbook]			
Instructed during class			
Continue to 電気電子計算工学及演習(2)			

Numbering code			
Course title <English>	電気電子工学のための量子論 Theory of Quantum for Electrical and Electronic Engineering	Affiliated department, Job title, Name	Graduate School of Engineering Professor, TAKEUCHI SHIGEKI
Target year	3rd year students or above	Number of credits	2
Course offered year/period		Course offered year/period	2019/First semester
Day/period	Wed.4	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
Quantum mechanics describes the behavior of electrons and photons and forms the foundation of natural law. It is also essential for understanding current electronic devices and various advanced quantum technologies such as quantum computers and quantum cryptography. In this lecture, we explain basic matters on quantum mechanics. After discussing the collapse of classical mechanics and old quantum theory, the Schrödinger equation and some solutions will be explained. After that, we discuss the general properties of the wave function and the uncertainty principle. In addition, the basics of quantum information science will be overviewed.			
[Course Goals]			
To grasp the physical image of the behavior of quanta. Specifically, we aim to understand fundamental concepts of quantum mechanics such as superposition state, uncertainty principle, quantum entanglement, etc. and to be able to perform some basic calculations using wave functions.			
[Course Schedule and Contents]			
1. Overview and old quantum theory (2 ~ 3times) After describing general features and applications of quantum mechanics, we explain the collapse of classical mechanics and the old quantum theory.			
2. Schrodinger equation (4 ~ 6times) We introduce the Schrödinger equation and discuss its eigenvalue problems of two dimensional and three dimensional potential well.			
3. Dynamics of quanta (1 ~ 2 times) We discuss the dynamics of quanta using time evolution operator.			
4. General properties of wave functions (3 ~ 4times) In order to discuss the general properties of wave functions, we introduce a complex linear space (Hilbert space) and explain orthogonality of wave functions and operators. In addition, the uncertainty principle will be discussed.			
5. Basics of quantum information technology (1 ~ 2times) The basics of quantum information technology is overviewed.			
Continue to 電気電子工学のための量子論(2)			

電気電子計算工学及演習(2)	
[Reference books, etc.]	
(Reference books) Introduced during class	
[Regarding studies out of class (preparation and review)]	
Students are expected to study on exercise problems at home.	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

電気電子工学のための量子論(2)	
[Class requirement]	
Basic knowledge of linear algebra, Fourier analysis, differential equation, dynamics, electromagnetism.	
[Method, Point of view, and Attainment levels of Evaluation]	
Evaluate comprehensively by regular test, quizzes during lectures, and some reports.	
[Textbook]	
Official textbook is not assigned.	
[Reference books, etc.]	
(Reference books) Some textbooks for reference will be introduced during the lecture.	
[Regarding studies out of class (preparation and review)]	
Preliminary review and review are indispensable. Some report tasks will be given (mandatory).	
(Others (office hour, etc.))	
Depending on the progress situation, the order of lecture items may be changed or some may be omitted.	
*Please visit KULASIS to find out about office hours.	

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Numbering code					
Course title <English>	電気電子計測 Electric and Electronic Measurement	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor,OKAMOTO RYOU		
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Fri.3	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
Understand the basics of the electrical and electronic measurements.					
[Course Schedule and Contents]					
Standards and traceability, 2times, The general theory of the measurement, the unit system, outlined of measurement standards and traceability. Error and evaluation of the measurement data, 2 ~ 3times, The concept of error and uncertainty, as well as the basic evaluation method of measurement data such as regression analysis Analog and digital signal processing, 2 ~ 3times, Amplification circuit using an operational amplifier (OA), DA and AD conversion, and Fourier transform. measurement technologies for electrical quantities, 5?6times, 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?2times, For example, optical measurements. Confirmation of learning achievement, 1time, Confirmation of learning achievements on electric and electronic measurements.					
[Class requirement]					
Electromagnetism, electrical and electronic circuits, mechanics					
[Method, Point of view, and Attainment levels of Evaluation]					
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.					
Continue to 電気電子計測(2)					

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Numbering code					
Course title <English>	電気電子数学I Mathematics for Electrical and Electronic Engineering I	Affiliated department, Job title,Name	Research Institute for Sustainable Humanosphere Professor, OOMURA YOSHIHARU Graduate School of Engineering Professor, DOI SHINJI		
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Fri.1	Class style	Lecture	Language	English
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
We learn mathematical methods to describe spatial and temporal evolutions of various physical phenomena.					
[Course Schedule and Contents]					
Classification of Partial Differential Equations, 2times, 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, 2times, Series solutions by Frobenius#039 method; trigonometric, Bessel, and Legendre functions. Singular points for ODE; Wronskian; linear independence of solutions; second solution Sturm-Liouville Theory, 1time, Self-adjoint ODE; Hermitian operator; Sturm-Liouville theory Green#039s Function Method, 1time, Green#039s function method to solve nonhomogeneous equations. Bessel Functions, 2times, 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, 1time, Legendre functions; generating functions; boundary value problems; associated Legendre polynomials. Fourier Series, 1time, Properties of Fourier Series, Gibbs Phenomenon Fourier Transform, 2times, Fourier integral, Fourier transforms of Gaussian and derivatives, Dirac delta function, Solutions of wave equation and diffusion equation Laplace Transform, 2times, Laplace transform, inverse Laplace transform, initial value problems of ODE Confirmation of Understanding, 1time, The level of understanding on all topics covered by this lecture will be confirmed through questions and discussion.					
[Class requirement]					
Calculus, Vector Analysis, Functions of Complex Variable, and English comprehension of the level of VOA Special English					
Continue to 電気電子数学I(2)					

電気電子計測(2)	
[Textbook]	
Kohro Yamazaki, Denki-denshi-keisoku-no-kiso (The institute of electrical engineers of Japan) isbn { } { 4886862489 }	
[Reference books, etc.]	
(Reference books)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.))	
Some topics may be skipped or swapped according to the progress of the lecture.	
*Please visit KULASIS to find out about office hours.	

電気電子数学I(2)	
[Method, Point of view, and Attainment levels of Evaluation]	
The grade will be given by adding all points of reports (5points x 13times) and a term examination(100points). A grade greater than or equal to 60 is successful. If the total point exceeds 100, the grade is given as 100.	
[Textbook]	
Mathematical Methods for Physicists: A Comprehensive Guide, Seventh Edition, Arfken, Weber, and Harris isbn { } { 9780123846549 } (Kindle version is available.)	
[Reference books, etc.]	
(Reference books)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.))	
Lectures are given mostly in English.	
*Please visit KULASIS to find out about office hours.	

Numbering code					
Course title <English>	電気電子数学 2 Mathematics for Electrical and Electronic Engineering 2	Affiliated department, Job title, Name	Graduate School of Engineering Professor, DOI SHINJI		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Wed.3	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
Transformation and approximation of data (signals) are basic tasks of any science or technology. Also, conceptions of linear space and linear mapping are the basis of not only such signal processing but of a number of engineering theories. Thus, this course discusses mainly signal theory and function approximation problems, explaining linear algebraic and functional analytic concepts and their engineering applications. Students learn the mathematical techniques needed in electrical and electronic engineering, specifically the concepts of linear space, functional analysis, and signal theory. Through this course, students not only learn the foundations of numerous subjects such as basic communications theory, control engineering, and signal/image processing, they also gain an expanded perspective from which they can look out on a number of different subjects.					
[Course Goals]					
Learn the mathematical techniques needed for electrical and electronic engineering, specifically the concepts of linear space, functional analysis, and signal theory.					
[Course Schedule and Contents]					
Linear space and linear mapping, 3-4 classes: Review linear algebra, explaining not only linear space in terms of matrix calculation but also describing the concepts of linear space and linear mapping. Describe expression on the basis of data (vectors) and its relation to eigenvalue problems, as well as the relationship between eigenvalue problems, on the one hand, and variation problems (minimax problems) and least squares approximation problems on the other, and explain the importance of linear algebraic concepts. Abstract space/signal space, 2-4 classes: Explain not only finite dimensional vectors, but also functional spaces with elements (vectors) of infinite dimensional signals/functions. Introduce metric spaces, and describe convergence, Cauchy sequences, and completeness within them. Also, introduce norms in linear space, norm spaces, and inner product spaces, and describe the properties of these spaces. Introduce examples of functional spaces, and describe convergence and completeness. Also, describe mapping (operators), projection, orthogonality, and orthogonalization in functional spaces, and again explain the importance of linear algebraic concepts. From abstract space to continuous/discrete signals, 2-3 classes: Introduce specific function systems as the bases of functional spaces. Explain the functional systems used frequently in analog and digital signal processing such as trigonometric functional systems and Haar functional systems. Also, describe how the polynomial systems of Legendre, Laguerre, and Hermite seen in Electrical and Electronic Mathematics 1 and Quantum Mechanics are produced by the orthogonalization of functions. Continuous/discrete signal transformation (basic), 2-3 classes: Discuss function expansion in terms of system and signal notation methods. Explain general Fourier series as an expansion upon trigonometric functional systems, and discuss application of continuous and discrete signals to least squares approximation problems. Continuous/discrete signal transformation (applied), 2-4 classes: Explain the various application methods used in system engineering and signal processing. Describe the discrete Fourier transform, wavelet expansion, and the finite element method in terms of the functional expansion by non-orthogonal (and a finite number					
----- Continue to 電気電子数学 2 (2)					

Numbering code					
Course title <English>	電気伝導 Electrical Conduction in Condensed Matter	Affiliated department, Job title, Name	Graduate School of Energy Science Professor, DOI TOSHIYA Graduate School of Engineering Associate Professor, KAKEYA ITSUHIRO		
Target year	4th year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Wed.2	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
This class is 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 Schedule and Contents]					
(1) Lattices and reciprocal lattices (2 classes) Explanation is made of lattices and reciprocal lattices, a fundamental item for understanding electron properties within an atom.					
(2) Fundamentals of quantum mechanics, and the hydrogen atom model (2 classes) A simple review is made of quantum mechanics, and explication is made of electron states (energy, spatial distribution, etc.) within hydrogen and atoms other than hydrogen.					
(3) Free-electron Fermi gas (3 classes) Explanation is made of the free-electron model as an ideal Fermi gas. Then, an overall explanation is provided of conductivity in metals, electronic specific heat, and the Hall effect.					
(4) Energy bands (2 classes) The band structure of electron energy within a solid crystal is introduced, and explanation is provided of conductivity and the band structures of conductors, semiconductors, and insulators.					
(5) Electron-phonon interactions, and conductivity in metals and semiconductors (2 classes) Lattice vibration is explained via quantized phonons (Bose particles) and Bose statistics, and lattice specific heat is introduced via determination of phonon density of state. Phonon scattering and electron scattering are explained. On this basis, explanation is then provided regarding the heat dependent nature of resistivity in metals, as well as of the Bloch-Gr#252neisen law at low temperature. Conductivity in semiconductors, especially scattering, is also explained.					
(6) Superconductivity (3 classes) With respect to superconductive phenomena, explanation is made, using the London equation, of the					
----- Continue to 電気伝導(2)					

電気電子数学 2 (2)	
----- of functions. Confirmation of learning attainment, 1 class: Confirm the degree of learning attained with respect to the above subjects.	
[Class requirement]	
Linear algebra, calculus	
[Method, Point of view, and Attainment levels of Evaluation]	
Final examination + report assignments	
[Textbook]	
Not used	
[Reference books, etc.]	
(Reference books) J.P.Keener 『Principles of Applied Mathematics』 (Westview Press) (Japanese translation: キーナー応用数学, 上下, 日本評論社)	
[Regarding studies out of class (preparation and review)]	
Review handouts and example solutions of problems provided in the class.	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

電気伝導(2)	
----- Meissner effect, etc. Overview explanation is made of the Ginzburg-Landau theory, and order parameters are introduced. The relationship between phase and vector potential, important for superconductivity, is explained, as well as the Josephson effect. Explained also is magnetic flux quantization within type II (high field) superconductors.	
(7) Feedback lesson (1 class) Confirmation of learned content is made based on evaluations of short tests and the score on the final examination, etc.	
[Class requirement]	
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.	
[Method, Point of view, and Attainment levels of Evaluation]	
Basically, an examination is imposed after the last class. A report may be imposed in case of necessity.	
[Textbook]	
C. Kittel, Introduction to Solid State Physics, 8th ed., Wiley isbn{}{047141526X} isbn{}{0471680575}	
[Reference books, etc.]	
(Reference books) quotSolid State Physicsquot by Ashcroft and Mermin isbn{}{0030839939}	
(Related URLs)	
(Students will be notified of this within class as soon as it is made available, as intended.)	
[Regarding studies out of class (preparation and review)]	
Preparing before classes and reviewing after classes are recommended.	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

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Numbering code					
Course title <English>	電気機器基礎論 Electric Machinerys Fundamentals	Affiliated department, Job title,Name	Graduate School of Energy Science Professor,SHIRAI YASUYUKI		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Mon.4	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
Master the fundamentals of various types of electric machinery					
[Course Schedule and Contents]					
General Introduction,1-2times,History of electro-magnetic energy conversion and electric machinery Electro-magnetic energy conversion,3-4times,fundamental theory of electro-magnetic energy conversion basic characteristics of electric machinery,8-9times,basic characteristics and configuration, equivalent circuit of various types of electric machinery general theory of rotating mahine,1time,general expression of electric machinery for dynamic performance analysis Evaluation of achievement,1time,Exercise					
[Class requirement]					
Electric Circuits, Electromagnetic Theory 1					
[Method, Point of view, and Attainment levels of Evaluation]					
mini-exercises in class and regular exam					
[Textbook]					
quotElectric Machineryquot,Ohm University Text Series, Ed. Yasuyuki Shirai, Ohm-sya (in Japanese) isbn{ } {4274216770}					
[Reference books, etc.]					
(Reference books)					
Electric machinery (1),(2) Ed. Sakutarou Nonaka, Morikita Syuppan (in Japanese) ISBN 4627720106 isbn{ } {4627720106}					
Electric machinery (1),(2) Ed. Takao Okada, Ohm-Sya (in Japanese) ISBN 4274128970 isbn{ } {4274128970}					
[Regarding studies out of class (preparation and review)]					
(Others (office hour, etc.))					
Office hour : Monday 12:00-13:00					
*Please visit KULASIS to find out about office hours.					

Numbering code					
Course title <English>	応用電気機器(2) Applied Electric Machinery	Affiliated department, Job title,Name	Graduate School of Engineering Program-Specific Professor,NAKAMURA TAKETSUNE		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Mon.3	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
Understand the basic theory of the radio wave, and technology for its industrial applications.					
[Course Schedule and Contents]					
Nature of the radio wave,2-3times,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,4-5times,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,2-3times,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,4-5times,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.					
[Class requirement]					
Knowledge of Electromagnetic theory 2 is required. Modulation Theory in Electrical Communication is recommended.					
[Method, Point of view, and Attainment levels of Evaluation]					
Grading is based on the regular examination, but the rating of reports may be considered as well.					
[Textbook]					
Hasebe Nozomu 電波工学 (radio engineering); 2nd Ed. (in Japanese) (Corona publishing) ISBN: 978-4-339-00773-2					
*Please visit KULASIS to find out about office hours.					

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Numbering code					
Course title <English>	応用電気機器 Applied Electric Machinery	Affiliated department, Job title,Name	Graduate School of Engineering Program-Specific Professor,NAKAMURA TAKETSUNE		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Mon.5	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[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 Schedule and Contents]					
Concept of output power and fundamental aspects of design in electric machineries,2-3times,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,1-2times,Discuss the load characteristics, kinetic characteristics, etc. of the rotating machineries are explained. Examples of visualized simulation results may also be shown for the aid of easier understanding. Principle of variable speed control of rotating machineries,6-8times,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,1-2times,Power conversion method for the realization of variable speed control is explained. Permanent magnet rotating machines,1time,Permanent magnet rotating 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,1time,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,1time,The classes are summarized. This is the feedback to students according to their score.					
[Class requirement]					
Electric Circuits, Electromagnetic Theory, Power Electronics, Control Theory					
Continue to 応用電気機器(2)					

Numbering code					
Course title <English>	電波工学 Radio Engineering	Affiliated department, Job title,Name	Research Institute for Sustainable Humanosphere Professor,SHINOHARA NAOKI Research Institute for Sustainable Humanosphere Professor,HASHIGUCHI HIROYUKI		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Mon.3	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
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.					
[Course Goals]					
Understand the basic theory of the radio wave, and technology for its industrial applications.					
[Course Schedule and Contents]					
Nature of the radio wave,2-3times,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,4-5times,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,2-3times,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,4-5times,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.					
[Class requirement]					
Knowledge of Electromagnetic theory 2 is required. Modulation Theory in Electrical Communication is recommended.					
[Method, Point of view, and Attainment levels of Evaluation]					
Grading is based on the regular examination, but the rating of reports may be considered as well.					
[Textbook]					
Hasebe Nozomu 電波工学 (radio engineering); 2nd Ed. (in Japanese) (Corona publishing) ISBN: 978-4-339-00773-2					
Continue to 電波工学(2)					

電波工学(2)
[Reference books, etc.] (Reference books) Balanis 『Antenna theory, 2nd Ed.』 (Wiley) ISBN:0471592684
[Regarding studies out of class (preparation and review)] A student should read text book before/after class.
(Others (office hour, etc.)) *Please visit KULASIS to find out about office hours.

アンテナ・伝搬工学(2)
[Class requirement] Students are required to be taking or to have taken a course in radio engineering.
[Method, Point of view, and Attainment levels of Evaluation] Grading method Scores on regular tests (80%) Student performance in classes (20%) Grading standards The following grades are given in accordance with the goal-achievement levels of each individual student: A+: Course goals have been accomplished at an extremely high level, from all perspectives. A: Course goals have been accomplished at a high level, from all perspectives. B: Course goals have been accomplished, from all perspectives. C: Confirmation can be made, from a majority of perspectives, of effects of student learning, and course goals have been accomplished to a certain extent. D: While course goals have been accomplished to a certain extent, further effort by the student is desirable. E: No confirmation can be made of effects of student learning, and it is difficult to say that a student has accomplished the goals of this class.
[Textbook] 長谷部 『電波工学』 (コロナ社) ISBN:4339007730
[Reference books, etc.] (Reference books) 新井 『新アンテナ工学』 (総合電子出版社) ISBN:4915449807 山口他 『電気電子計測』 (オーム社) ISBN:4274128733 前田・木村 『現代電磁波動論』 (オーム社) ISBN:4274128024 高野他 『宇宙における電波計測と電波航法』 (コロナ社) ISBN:4339012211
[Regarding studies out of class (preparation and review)] Students should prepare and review the contents as instructed during each class period.
(Others (office hour, etc.)) No specific office hours have been set. When you want to talk directly, please first contact us by e-mail of your intention to either of the following e-mail addresses. Prof. Yamamoto (yamamoto@rish.kyoto-u.ac.jp) Prof. Hashiguchi (hasiguti@rish.kyoto-u.ac.jp) *Please visit KULASIS to find out about office hours.

Numbering code		Course title <English> アンテナ・伝搬工学 Antenna and Propagation Engineering		Affiliated department, Job title, Name Research Institute for Sustainable Humanosphere Professor.YAMAMOTO MAMORU Research Institute for Sustainable Humanosphere Professor.HASHIGUCHI HIROYUKI
Target year	4th year students or above	Number of credits	2	Course offered year/period 2019/First semester
Day/period	Thu.2	Class style	Lecture	Language Japanese
[Outline and Purpose of the Course] In this course, students learn about various types of electromagnetic field analysis techniques and antenna pattern synthesis theory used in characteristic analysis and design of antenna. Then, an overview of radio application technologies (radio-wave propagation, different types of radar, etc.) is presented, as well as a look at the current situation regarding these technologies.				
[Course Goals] Based on a knowledge of radio engineering, students will gain a higher level of understanding of electromagnetic-wave concepts and of specific technologies in which electromagnetic waves are used.				
[Course Schedule and Contents] Pattern synthesis for array antenna (2-3 classes) Students learn the fundamentals of optimal pattern synthesis theory used to improve array antenna gain and to suppress sidelobes. Taken up especially are Dolph-Thomas and Taylor methods. Students also learn about adaptive array technology. Fundamentals of electromagnetic field analysis (3-4 classes) Explained are the principles and characteristics of various methods used to determine electromagnetic fields radiating from antennas and dynamic impedance, including the finite element method (FEM), electromotive force method, method of moments, physical optics method, finite-difference time-domain (FDTD) method, etc. Radio wave propagation (2-3 classes) Explained are fading in wireless communications, propagation in outer space communications, remote sensing applications, etc. Radar technology (2-3 classes) Explanation is made of principles of measuring distance and speed using radar, and of element technologies including pulse compression method, etc. Discussion also covers the principles and signal processing methods of example applications of radar technologies, including meteorological radar, atmospheric radar, and synthetic aperture radar. Radio navigation (1-2 classes) Explanation is made of the principles of technologies for measuring the positions/locations of ships and aircraft, etc., by using radio waves. Discussion also covers an overview and applications of radio navigation methods, as represented by the global positioning system (GPS). Confirmation of extent of student learning (1 class) Confirmation (evaluation) is made of the extent that students have learned the contents of this course.				
Continue to アンテナ・伝搬工学(2)				

Numbering code		Course title <English> 組み込み計算機システム Embedded Computer Systems		Affiliated department, Job title, Name Graduate School of Informatics Professor.SATOU TAKASHI
Target year	3rd year students or above	Number of credits	2	Course offered year/period 2019/Second semester
Day/period	Wed.1	Class style	Lecture	Language Japanese
[Outline and Purpose of the Course] This lecture covers basics of embedded systems. Processor architectures, memory subsystems, I/O systems, and overall system architectures in embedded systems will be explained.				
[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 Schedule and Contents] Basic properties of computer systems (1 week): History of embedded computer systems. Cache memory (3 weeks): Cache architectures, data transfer between main memory and cache. Compiler optimization (1 week): A role of compilers in computer systems and performance tuning by code optimization. Main memory virtualization (2 weeks): Effective use of main memory and secondary memory, memory virtualization, and address conversion. Operating system and interrupt (2 weeks): 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 weeks): The concept of instruction pipelining, necessary mechanisms for the pipelining, and characteristics of RISC processors. Instruction formats and addressing modes (2 weeks): Formats and addressing modes of typical instructions. Trends in embedded systems (1 week): Recent trends on embedded computer architectures such as multi-core processors. Review (1 week): The review of understanding on this lecture.				
[Class requirement] logic circuits (60120), computer architecture basics (60160)				
[Method, Point of view, and Attainment levels of Evaluation] The level of achievement toward the goal of this lecture will be examined by the end-of-term exam.				
Continue to 組み込み計算機システム(2)				

組み込み計算機システム(2)	
[Textbook]	
The course will loosely follow "Computer Organization and Design: The Hardware/Software Interface" by Patterson and Hennessy. Having an access to a copy is strongly recommended.	
[Reference books, etc.]	
(Reference books) David Patterson and John Hennessy 『Computer Organization and Design: The Hardware/Software Interface』	
[Regarding studies out of class (preparation and review)]	
Homework will be assigned. Deepen understanding through solving the homework and through reading textbooks.	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

Numbering code					
Course title <English>	集積回路工学 Integrated Circuits Engineering	Affiliated department, Job title, Name	Graduate School of Informatics Professor, ONODERA HIDETOSHI Graduate School of Informatics Professor, SATOU TAKASHI		
Target year	4th year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Thu.4	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
This lecture explains design methodologies for CMOS LSI circuits. Both analog and digital circuits will be covered.					
[Course Goals]					
From this lecture, you can understand design flow of CMOS LSI circuits.					
[Course Schedule and Contents]					
Following topics will be covered. By assessing the understanding of the students and adding explanations and tasks when necessary, we will spend the number of weeks listed in [].					
(1) CMOS process and devices [2 weeks] 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.					
(2) Analog circuit design [2 weeks] 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.					
(3) Digital circuit design [4 weeks] Design methodologies for combinational and sequential circuits are explained. Hardware algorithms for arithmetic logic unit will be discussed.					
(4) Evaluation and optimization of digital circuits [2 weeks] Methodologies for evaluating and optimizing the power consumption and delay of circuits are explained. Test methods will be also explained.					
(5) Full custom layout design [2 weeks] 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.					
(6) Chip level layout design [2 weeks] Layout design methods and chip-level assembly methods in a cell-based design flow will be explained.					
(7) Confirmation of understanding [1 week] The level of understanding will be confirmed. Feedback will be given if necessary.					
----- Continue to 集積回路工学(2)					

Numbering code					
Course title <English>	生体工学の基礎 Basics of Biomedical Engineering	Affiliated department, Job title, Name	Graduate School of Engineering Professor, KOBAYASHI TETSUO Graduate School of Engineering Professor, DOI SHINJI		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Tue.1	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
The course provides basic knowledge of life system, electrophysiology, biomedical engineering and human brain functions.					
[Course Goals]					
To understand basic knowledge of on life system, electrophysiology, biomedical engineering and human brain functions.					
[Course Schedule and Contents]					
Life system, 2times, Electrophysiology and Neurophysiology, 5times, Central nervous system, 3times, Measurement and Imaging of brain functions, 4times, Review, 1time,					
[Class requirement]					
None					
[Method, Point of view, and Attainment levels of Evaluation]					
Rating is based on the comprehensive evaluation by the examination held at the end of the semester as well as some reports given at the class.					
[Textbook]					
Not used					
[Reference books, etc.]					
(Reference books) Handouts are given at the class or uploaded on a webpage of KULASIS.					
[Regarding studies out of class (preparation and review)]					
Review handouts provided in the class.					
(Others (office hour, etc.))					
*Please visit KULASIS to find out about office hours.					

集積回路工学(2)	
[Class requirement]	
Logic circuits, Computer engineering, Digital circuits, Embedded computer system	
[Method, Point of view, and Attainment levels of Evaluation]	
The level of achievement toward the goal of this lecture will be examined by the results of reports. All reports are mandatory.	
[Textbook]	
Hand-outs will be provided.	
[Reference books, etc.]	
(Reference books) Waste and Harris 『CMOS VLSI Design: A Circuits and Systems Perspective』 (Addison Wesley) ISBN: 978-0321547743	
[Regarding studies out of class (preparation and review)]	
All reports are mandatory. Practices provided in the lecture should be solved after the lecture.	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

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Numbering code			
Course title <English>	メカトロニクス入門 Introduction of Mechatronics	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor, ENDO TAKAHIRO Graduate School of Engineering Professor, MATSUNO FUMITOSHI
Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Second semester		
Day/period	Wed.4	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
[Course Goals]			
[Course Schedule and Contents]			
,3times, ,6times, ,3times, ,2times, ,1time,			
[Class requirement]			
None			
[Method, Point of view, and Attainment levels of Evaluation]			
[Textbook]			
[Reference books, etc.]			
(Reference books)			
[Regarding studies out of class (preparation and review)]			
(Others (office hour, etc.))			
*Please visit KULASIS to find out about office hours.			

情報通信工学(2)			

[Regarding studies out of class (preparation and review)]			
(Others (office hour, etc.))			
*Please visit KULASIS to find out about office hours.			

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Numbering code			
Course title <English>	情報通信工学 Information and Communication Engineering	Affiliated department, Job title,Name	Graduate School of Informatics Professor, MORIKURA MASAHIRO Graduate School of Informatics Professor, HARADA HIROSHI Graduate School of Informatics Professor, Oki Eiji Graduate School of Informatics Associate Professor, MURATA HIDEKAZU Graduate School of Informatics Associate Professor, YAMAMOTO KOUJI Graduate School of Informatics Associate Professor, SHINKUMA RIYOUICHI
Target year	4th year students or above	Number of credits	2
Course offered year/period	2019/First semester		
Day/period	Tue.3	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
[Course Goals]			
[Course Schedule and Contents]			
,3times, ,3times, ,3times, ,3times, ,2times, ,1time,			
[Class requirement]			
None			
[Method, Point of view, and Attainment levels of Evaluation]			
[Textbook]			
[Reference books, etc.]			
(Reference books)			

Continue to 情報通信工学(2)			

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Numbering code			
Course title <English>	電子物性工学 Solid State Physics and Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor, SHIRAISHI MASASHI Graduate School of Engineering Associate Professor, GOTOU YASUHIITO
Target year	4th year students or above	Number of credits	2
Course offered year/period	2019/First semester		
Day/period	Tue.4	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
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.			
[Course Goals]			
As described in the course description			
[Course Schedule and Contents]			
Interaction between electron beam and atoms,3times, ,2times, ,2times, k-space,3times, physics of quasi-particle,1time, magnetics and spintronics,3times, ,1time,			
[Class requirement]			
Brief review of solid-state physics until the 3rd year courses.			
[Method, Point of view, and Attainment levels of Evaluation]			
Exam. and reports			
[Textbook]			
None			
[Reference books, etc.]			
(Reference books)			
[Regarding studies out of class (preparation and review)]			
(Others (office hour, etc.))			
*Please visit KULASIS to find out about office hours.			

Numbering code					
Course title <English>	真空電子工学 Vacuum Electronic Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor.GOTOU YASUHIRO Graduate School of Engineering Professor.SHIRAIISHI MASASHI		
Target year	3rd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Thu.1	Class style	Lecture	Language	Japanese
[Outline and Purpose of the Course]					
Fundamentals on behavior of electrons in vacuum, and also fundamentals on the control of electron beams are given; the lecture includes electrons in solids, extraction of electrons from solid to vacuum, electron optics, and electron devices.					
[Course Goals]					
To understand how to control the charged particles by electro-magnetic fields, by learning the behavior of electrons in solids and electro-magnetic fields.					
[Course Schedule and Contents]					
[Behavior of electrons in solids] 3 times (Shiraishi) Electronic properties of materials which are originated by the lattice structure and its periodicity, namely formation of band structure and work function will be described. Special attention will be paid for reciprocal and real lattice spaces, and behavior of the electrons in solids will be presented.					
[Extraction of electrons from solid to vacuum] 4 times (Gotoh) The mechanism of thermionic and field emission, which are mostly used to extract electrons in solids to vacuum, will be described in detail. The formula of the extractable current density for each mechanism will be presented, explaining the effects of image force and space charges.					
[Motion of electrons in electromagnetic fields and its control] 4 times (Gotoh) The electron trajectories in electrostatic, magnetostatic, and orthogonal electromagnetic fields will be described. Lens effects of the electrostatic and magnetostatic fields will also be described, and concrete idea for application of these effects to practical devices will be presented.					
[Electron beam devices] 3 times (Gotoh) Operational principle of the electron devices based on electron beams, namely vacuum tubes, will be described. Especially, principles of a velocity modulation tube will be presented, showing the advantage of vacuum electron devices for high power and high frequency application.					
[Feedback] Once (Shiraishi and Gotoh) Summarizing the above contents, degree of understanding will be evaluated.					
----- Continue to 真空電子工学(2)					

Numbering code					
Course title <English>	電気電子回路演習 Exercise of Electric and Electronic Circuits	Affiliated department, Job title,Name	Graduate School of Energy Science Professor.SHIMODA HIROSHI Graduate School of Engineering Associate Professor.HISAKADO TAKASHI Graduate School of Engineering Associate Professor.EBIHARA YOSHIO Institute for Information Management and Communication Associate Professor.AOKI TAKAOKI Graduate School of Energy Science Associate Professor.ISHIZAWA AKIHIRO Institute for Liberal Arts and Sciences Program-Specific Senior Lecturer.KIMURA MASAYUKI		
Target year	2nd year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Thu.3,4	Class style	Seminar	Language	Japanese
[Outline and Purpose of the Course]					
Students will gain an understanding of phenomena that will serve as linkages between calculus and linear algebra, etc., learned during their first university year, and theories of electrical and electronic circuits. Students will also learn the basic concepts and ways of thinking employed in the field of electrical and electronic engineering. Also, in their personal environments, students will be able to learn about, via trial-and-error freely and at their own initiative numerical calculation, circuit simulation, and circuit testing. In their group, students will select a theme they find interesting, and via discussions using poster presentations, etc., students will deepen their mutual understanding and have the opportunity to be exposed to a variety of different opinions.					
[Course Goals]					
Via circuit theory, numerical calculation, circuit simulation, and circuit testing, students will boost their understanding of electrical and electronic circuits via linkages between a variety of viewpoints. The aim is for each student to establish a base on which to build their own subjective ideas and areas of interest within the broad field of electrical and electronic engineering.					
[Course Schedule and Contents]					
Overview explanation (1 class) An overview of this seminar is presented, covering the topics of evaluations, goals, and progress methods. The seminar environment will be established during this first class.					
Time-domain analysis (3 classes) With respect to differential equations of circuits, via analysis using circuit simulators, phase plane analysis using linear algebra, and simple circuit experimentation, students will learn how to "decompose" phenomena into those of low-dimensional systems, so as to gain a better understanding.					
Frequency-domain analysis (2 classes) Students will learn about alternating-current (AC) circuit theory via linkages with time domain analysis.					
2-port circuits (2 classes) For circuits having input and output, students will learn about frequency characteristics from the viewpoint of pole-zero structure.					
----- Continue to 電気電子回路演習(2)					

真空電子工学(2)	
[Class requirement]	
Fundamental knowledge on electromagnetic theory, dynamics, electrons in solids, and electric and electronic circuits is necessary.	
[Method, Point of view, and Attainment levels of Evaluation]	
Grading will be done with the result of the term-end examination.	
[Textbook]	
Not used No textbook will be used, but supplemental materials may be distributed for some cases.	
[Reference books, etc.]	
(Reference books) Tetsuro Tanaka 『 _a (Asakura) ISBN:978-4-254-21003-3 Zyunzo Ishikawa 『 _a (Corona) ISBN:978-4-339-00734-3	
[Regarding studies out of class (preparation and review)]	
[Behavior of electrons in solids] (In preparation) Review the band structure, density of states of electrons in solids, etc. that you learned at "Fundamentals of Electron Physics and Devices" in the 2nd grade.	
[Extraction of electrons from solid to vacuum] (In preparation) Review the Poisson's equation, image charge method, etc. that you learned at "Electromagnetic Theory 1" in the 2nd grade.	
[Motion of electrons in electromagnetic fields and its control] (In preparation) Review the equations of motion of charged particles in electromagnetic fields that you are learning at "Electromagnetic Theory 2" in the 3rd grade.	
[Electron beam devices] (In preparation) Review the operating principle of semiconductor transistors and their equivalent circuits that you learned at "Electronic Circuits" in the 2nd grade.	
(Others (office hour, etc.))	
Bring your calculator, for the exercise that will be made in the class.	
Suggested reading: Steven Weinberg, "The discovery of subatomic particles", trans. by Saburo Honma (Chikuma) ISBN: 978-4-480-08967-5.	
*Please visit KULASIS to find out about office hours.	

電気電子回路演習(2)	
[Class requirement]	
Group discussion (1 class) To deepen student understanding of course contents, investigation will be made regarding the contents of poster presentations.	
Active circuits (3 classes) Students will understand the concept of bias and deepen their understanding of circuit simulators and testing using amplification, switches, and feedback.	
Presentations (3 classes) Via their preparations for poster presentations, as well as their actual presentations, students will deepen their understanding of course content; this will also provide an opportunity to confirm the extent of learning of each student.	
[Class requirement]	
Prerequisites for this course are courses in fundamental theory of electrical circuits and in electrical and electronic circuits.	
[Method, Point of view, and Attainment levels of Evaluation]	
Reports, etc., shall be used to evaluate students' level of understanding of electrical and electronic circuits. Also, attitudes of students in the seminar classroom and their proactive efforts to improve will be included in evaluations. This means that attendance at seminar sessions is mandatory.	
[Textbook]	
京都大学工学部電気系教室編：電気電子回路演習2016年度版	
[Reference books, etc.]	
(Reference books) 奥村浩士 『エース電気回路理論入門』(朝倉書店) ISBN:4254227469 北野正雄 『電子回路の基礎』(レイメイ社)	
[Regarding studies out of class (preparation and review)]	
As preparation for each seminar class, assigned exercises are to be performed and submitted to PandA. For review, students should perform work on advanced problems at home.	
(Others (office hour, etc.))	
For exercises, assigned machines (notebook PC, breadboard, etc.) shall be brought to the classroom. Prior to starting their seminar, students are to attend a guidance meeting for an explanation of the overall course. Students who borrow portable calculation devices to perform experiments should manage these devices appropriately. Office hours are in the Professor 's Lounge (S101) during second period on Thursdays. Students who do not understand pre-class assignments should definitely come during office hours and attend the seminar class only after their problems have been resolved.	
*Please visit KULASIS to find out about office hours.	

Numbering code			
Course title <English>	電気電子工学基礎実験	Affiliated department, Job title,Name	Research Institute for Sustainable Humanosphere Professor,KOJIMA HIROTSUGU Research Institute for Sustainable Humanosphere Associate Professor,MITANI TOMOHIKO Graduate School of Engineering Associate Professor,ASANO TAKASHI Graduate School of Engineering Associate Professor,SUGIYAMA KAZUHIKO Graduate School of Informatics Associate Professor,YAMAMOTO KOUII Graduate School of Energy Science Associate Professor,ISHII HIROTAKE Graduate School of Engineering Assistant Professor,OSHIMA RYO Graduate School of Engineering Assistant Professor,TAKASHIMA HIDEAKI Graduate School of Engineering Assistant Professor,NISHI YUUSUKE Graduate School of Engineering Assistant Professor,ISHIZAKI KENJI Graduate School of Engineering Assistant Professor,INOUE TAKUYA Graduate School of Informatics Assistant Professor,SATO TAKEHIRO Research Institute for Sustainable Humanosphere Assistant Professor,YABUKI MASANORI Graduate School of Informatics Assistant Professor,HIGASHI HIROSHI Institute of Advanced Energy Assistant Professor,KOBAYASHI SHINJI Institute of Advanced Energy Assistant Professor,OHSHIMA SHINSUKE Graduate School of Engineering Assistant Professor,KANEKO MITSUAKI
	Fundamental Practice of Electrical & Electronic Engineering		
Target year	2nd year students or above	Number of credits	2
Course offered year/period	2019/Second semester		
Day/period	Thu.1,2,3,4	Class style	Experiment
Language	Japanese		
[Outline and Purpose of the Course]			
Via actual test measurements of the characteristics of electronic elements using basic measurement devices employed in electrical and electronic engineering fields, students will acquire the skills required for using these devices. Tests will also be performed to conduct initial step investigation of the mechanisms of electronic and electrical circuits and elements, and to deepen students' understanding of electrical and electronic engineering fields.			
[Course Goals]			
The goals of this course are for students to acquire initial-stage testing techniques used within the electrical and electronic engineering fields, and to understand electrical and electronic circuits. The aim is to have students achieve these goals chiefly via the creation of electrical and electronic circuits, and via measurement			
Continue to 電気電子工学基礎実験(2)			

電気電子工学基礎実験(2)			
tests of the characteristics of these circuits.			
[Course Schedule and Contents]			
Fundamentals of experiments in electrical and electronic engineering (lectures and experiments) (3 classes) Discussion is made of aspects necessary in the performance of electronic/electrical engineering experiments, namely, the securing of a safe environment, the proper way to take experimental notes, how to draw graphs, and how to write related reports. Students will learn how to use an oscilloscope, which will give them a foundation in measurement technologies. Students will also have the opportunity to edit reports created by others, an activity designed to give them even keener insights in report writing.			
Passive elements (experiments) (2 classes) Frequency characteristics measurements (amplification, phase, etc.) are performed for circuits made from passive elements such as coils, capacitors, resistors, etc.			
Active elements and amplifier circuits (experiments) (6 classes) In these classes, characteristics measurements are performed for circuits made from diodes, bipolar transistors, and operational amplifiers. Through these experiments, students will gain an understanding of the operations of amplifier circuits, etc.			
Logic circuits (experiments) (2 classes) Students design and make combination circuits and sequential circuits to understand their operations.			
Confirmation of extent of student learning (2 classes) Students will be asked questions regarding experiment methods, contents/details, and report writing. This will help to deepen student understanding of experimentation details and will also enable confirmation of the extent of student learning in this course.			
[Class requirement]			
Prerequisites for this course are "Fundamentals of Circuit Theory" and "Electric and Electronic Circuits."			
[Method, Point of view, and Attainment levels of Evaluation]			
From the contents of experiment reports, evaluations can be made with respect to the extent of student learning of experimental techniques, as well as regarding the level of their understanding of electrical and electronic circuits. Each student's attitudes and engagements will also be evaluated in the experimental laboratory, and with respect to how proactive students are in striving for improvement. In other words, attendance at experiments is mandatory!			
[Textbook]			
京都大学工学部電気系教室編 『電気電子工学基礎実験 2019年度版』 木下是雄 『理科系の作文技術』(中公新書) ISBN:4121006240			
Continue to 電気電子工学基礎実験(3)			

電気電子工学基礎実験(3)			
[Reference books, etc.]			
(Reference books)			
奥村浩士 『エース電気回路理論入門』(朝倉書店) 奥村浩士 『電気回路理論』(朝倉書店) 北野正雄 『電子回路の基礎』(レイメイ社)			
[Regarding studies out of class (preparation and review)]			
Students must be sure to attend the guidance meeting to be held before experiments begin, where they will receive an overall explanation, education on safety, etc.			
(Others (office hour, etc.))			
A portion of course contents may be omitted or changed, or new contents may be added. On class days when experiments are performed, students must be sure to bring with them items designated beforehand, including report forms, etc.			
*Please visit KULASIS to find out about office hours.			

Numbering code			
Course title <English>	生体医療工学	Affiliated department, Job title,Name	Graduate School of Informatics Professor,MATSUDA TETSUYA Graduate School of Engineering Professor,KOBAYASHI TETSUO Academic Center for Computing and Media Studies Professor,KOYAMADA KOUII Graduate School of Informatics Professor,ISHII SHIN Graduate School of Engineering Professor,DOI SHINJI Graduate School of Informatics Associate Professor,NAKAO MEGUMI Graduate School of Informatics Senior Lecturer,OHBA SHIGEYUKI Graduate School of Energy Science Professor,SHIMODA HIROSHI
	Electrical and Electronic Engineering in Biomedical Applications		
Target year	4th year students or above	Number of credits	2
Course offered year/period	2019/First semester		
Day/period	Tue.1	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
The course provides technologies based on electrical and electronic engineering in biomedical applications.			
[Course Goals]			
To acquire fundamental knowledge of physiological phenomena and functions, and mathematical models, and understand simulation and analysis methods in biomedical applications			
[Course Schedule and Contents]			
Cell/biodynamics simulation,2-3times,electrophysiology, computer simulation of cell and biodynamics Brain function measurement,2-3times,brain nerve system, magnetoencephalogram (MEG), functional magnetic resonance imaging (fMRI), and their applications Visualization,2-3times,visualization techniques for numerical simulation, steering, optimization Modeling and simulation of brain nerve system,2-3times,simulation of information processing in neuron, mathematical modeling and analysis of higher brain function, bioinformatics Cognitive engineering,2-3times,features of human cognitive activities from the viewpoint of psychology, cognitive engineering and its applications Biomedical systems,2-3times,systems engineering approach and biomedical application to life Review,1time,The level of understanding on this lecture will be confirmed.			
[Class requirement]			
None			
Continue to 生体医療工学(2)			

生体医療工学(2)	
[Method, Point of view, and Attainment levels of Evaluation]	
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.	
[Textbook]	
Handouts are given at the class.	
[Reference books, etc.]	
(Reference books)	
[Regarding studies out of class (preparation and review)]	
Report assignment will be given for each topic.	
(Others (office hour, etc.))	
The contents of the lecture and their order are subject to changes depending on the situation each year.	
*Please visit KULASIS to find out about office hours.	

電気電子工学実験(2)	
(DC) machines, and synchronous machines. Students will gain an understanding of the characteristics of generators and electric motors, and they will also study three-phase alternating current.	
Semiconductor characteristics and devices (4 classes) Students will measure band gap, light absorption, and other characteristics of semiconductors; measurement is also made of the characteristics of diodes and field-effect transistors, basic devices that use semiconductors. In this way, students gain an understanding of their operations and of the physics that serve as the background for such devices.	
Fundamentals of electromagnetic waves (2 classes) Experiments are performed on the propagation of electromagnetic waves in dual conductor lines and in free space, enabling students to gain knowledge of the characteristics and measurement methods of electromagnetic waves.	
Microcomputers (2 classes) Using microcomputers, students will gain an understanding the structure (composition) and functions of computers, as well as an understanding of the relationships between hardware and software within a computing system.	
Communications fundamentals (2 classes) Measurement is made of time signals and frequency spectra, the basic modulation method used in communications. Students will understand the characteristics of various modulation methods, as well as the effects of sampling.	
Confirmation of extent of student learning (2 classes) Discussion is made regarding experiment methods and contents, enabling students to deepen their understanding of experiment details and giving them a greater ability to explain the like. Additionally, confirmation is made of the extent of student learning.	
[Class requirement]	
Prerequisites for this course are student acquisition of fundamental knowledge of electrical circuits, electronic circuits, and electromagnetism. Students must also have completed a course in fundamental practice of electrical & electronic engineering.	
[Method, Point of view, and Attainment levels of Evaluation]	
From the contents of experiment reports, evaluations can be made with respect to the extent of student learning of experimental techniques, as well as regarding the level of their understanding of electrical and electronic circuits. Evaluation will also be made of each student ' s attitudes and engagement in the experimental laboratory. Therefore, attendance at experiments is mandatory!	
[Textbook]	
京都大学工学部電気系教室編：電気電子工学実験2019年版	
Continue to 電気電子工学実験(3)	

Numbering code	
Course title <English>	電気電子工学実験 Practice of Electrical and Electronic Engineering
	Affiliated department, Job title,Name
Graduate School of Engineering Associate Professor,FUNATO MITSURU Graduate School of Engineering Program-Specific Associate Professor,ANDO YUUICHIROU Graduate School of Engineering Program-Specific Professor,NAKAMURA TAKETSUNE Graduate School of Engineering Assistant Professor,OIDA TAKENORI Research Institute for Sustainable Humanosphere Assistant Professor,UEDA YOSHIKATSU Graduate School of Informatics Associate Professor,MURATA HIDEKAZU Graduate School of Engineering Associate Professor,OKAMOTO RYOU Graduate School of Engineering Associate Professor,KOBAYASHI KEI Graduate School of Engineering Senior Lecturer,NAKANISHI TOSHIHIRO Academic Center for Computing and Media Studies Senior Lecturer,KONDO KAZUAKI Graduate School of Informatics Assistant Professor,MIZUTANI KEIICHI Graduate School of Engineering Assistant Professor,HOSOE YOUHEI	
Target year	3rd year students or above
Number of credits	2
Course offered year/period	2019/First semester
Day/period	Fri.1,2,3,4
Class style	Experiment
Language	Japanese
[Outline and Purpose of the Course]	
In this course, students acquire fundamental knowledge and practical skills, via basic experiments and discussions, regarding electrical machines, semiconductor properties and devices, electromagnetic waves, computers, and communications.	
[Course Goals]	
The goals of this class are for students to gain an understanding of fundamental items, including the principles and characteristics of various electrical equipment, semiconductor characteristics and device characteristics, electromagnetic wave propagation and interference, computer hardware and software, characteristics of communication methods, etc.	
[Course Schedule and Contents]	
Overview of practical of electrical and electronic engineering (1 class) Explanation is made of fundamental items and points of special precaution for experiments in electrical and electronic engineering, and students are educated in safety issues related to experiments.	
Electrical equipment and devices (2 classes) Students perform measurement of the basic characteristics of transformers, induction machines, direct current	
Continue to 電気電子工学実験(2)	

電気電子工学実験(3)	
[Reference books, etc.]	
(Reference books) 京都大学工学部電気系教室編：電気電子工学基礎実験	
[Regarding studies out of class (preparation and review)]	
Students must read and study the textbook before each experiment.	
(Others (office hour, etc.))	
Students are required to attend the 1st class (Overview of Practice of Electrical and Electronic Engineering) to be held before experiments begin. At this class, overall explanations are made, as well as education about safety, etc.	
*Please visit KULASIS to find out about office hours.	

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Numbering code			
Course title <English>	電気電子工学実習 Advanced Practice of Electrical and Electronic Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,FUJITA SHIZUO
			Graduate School of Engineering Associate Professor,GOTOU YASUHIRO
Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Second semester		
Day/period	Fri.1,2,3,4	Class style	Practical training
Language	Japanese		
[Outline and Purpose of the Course]			
[Course Goals]			
[Course Schedule and Contents]			
Techniques and safety for experiments,1time, Power electronics,4times, DC servo motors,4times, Semiconductor devices ,4times, Materials for electronics,4times, Communication systems,4times, Logic circuits,4times, Feedback,2times,			
Continue to 電気電子工学実習(2)			

電気電子工学実習(2)	
None	
[Method, Point of view, and Attainment levels of Evaluation]	
[Textbook]	
[Reference books, etc.]	
(Reference books)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

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Numbering code			
Course title <English>	電力システム工学 Power System Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HIKIHARA TAKASHI
			Graduate School of Energy Science Professor,SHIRAI YASUYUKI
Target year	3rd year students or above	Number of credits	2
Course offered year/period	2019/Second semester		
Day/period	Mon.1	Class style	Lecture
Language	Japanese		
[Outline and Purpose of the Course]			
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.			
[Course Goals]			
The goal of this course is to understand fundamentals of power systems engineering, including their operation, analysis, and control.			
[Course Schedule and Contents]			
Introduction,1time,Features of power system and the purpose of network operation are introduced. System structure and Per Unit (PU) system,1-2times,DC and ac power transmission are explained from the view point of system structure. Per unit method is explained. Frequency control,2-3times,Controlling methods for keeping synchronicity at 60/50 Hz are explained. Voltage control,2times,Voltage levels of power system is classified. The control method for keeping the voltage constant is explained. Stability,3times,System stability is explained from the view point of engineering and applied mathematics. Fault analysis,2times,Fault analysis of power system is introduced. System Operation,1-2times,Operating method of power system with various power sources. Summary, 1 times,			
[Class requirement]			
Circuit Theory (60630, 60030, 60220); Electric Machinery Fundamentals (61050); Electric Power Engineering 1 (61070)			
[Method, Point of view, and Attainment levels of Evaluation]			
Final examination and homework.			
[Textbook]			
Handouts.			
[Reference books, etc.]			
(Reference books)			
Y. Ohsawa, Power Systems Engineering (Ohm-Sha) (in Japanese) isbn{ }{4274132307} ; Y. Sekine, Power system engineering (Denki-Shoin) (in Japanese) ibid{ }{TW86022983}			
Continue to 電力システム工学(2)			

電力システム工学(2)	
[Regarding studies out of class (preparation and review)]	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

Numbering code			
Course title <English>	応用電工学 Applied Electric Power Engineering	Affiliated department, Job title, Name	Graduate School of Engineering Professor.MATSUO TETSUJI Graduate School of Energy Science Associate Professor.TAKAI SHIGEOMI
Target year	4th year students or above	Number of credits	2
		Course offered year/period	2019/First semester
Day/period	Mon.3	Class style	Lecture
		Language	Japanese
[Outline and Purpose of the Course]			
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.			
[Course Goals]			
The goal of this course is to understand fundamentals of power generation technologies.			
[Course Schedule and Contents]			
"1. Introduction (1 class)			
Provide an overview of present conditions, future trends, etc. with respect to energy supply, including electric power, and describe the outline of the course and its goals.			
2. Thermal power generation (3 classes)			
After reviewing the basics of thermodynamics, explain the types of thermal power stations, including combined cycle power generation, as well as the components and operating principles of thermal power generation plants.			
3. Hydroelectric power generation (2 classes)			
After discussing the basics of hydraulics, explain the structures and characteristics of public works such as the dams, waterways, surge tanks, pipelines, etc. that make up hydroelectric power stations, as well as hydraulic turbines and hydraulic turbine generators.			
4. Nuclear power generation (3 classes)			
After reviewing the basics of atomic physics, explain basic information on nuclear fission, which is the core of nuclear power generation, and the operation of nuclear reactors, as well as the types of nuclear power stations and nuclear fuel.			
5. Electrical generation methods using renewable energy (2 classes)			
As well as explaining electrical generation and environmental problems, explain methods of generating electricity that use renewable energy, i.e., alternative energy sources such as solar power and wind power.			
5. Electrical generation by battery (2 classes)			
----- Continue to 応用電工学(2)			

Numbering code		U-ENG26 46997 GB72	
Course title <English>	特別研究 Graduation Thesis	Affiliated department, Job title, Name	Graduate School of Engineering ALL STAFF
Target year	4th year students or above	Number of credits	6
		Course offered year/period	2019/Intensive, year-round
Day/period	Intensive	Class style	Seminar
		Language	Japanese
[Outline and Purpose of the Course]			
電気電子工学に関連するテーマについて研究を進め、学士論文を作成する。			
[Course Goals]			
研究テーマに関する議論・討論・演習を通じ、研究課題抽出・問題解決能力などの研究能力を得るとともに、学術的・技術的内容を明確に説明するコミュニケーション能力を高める。			
[Course Schedule and Contents]			
指導教員と協議して決める。 例えば、週2コマ程度のゼミと、週1回以上の個別の課題検討など。			
[Class requirement]			
特別研究を開始するためには、その年度の初めに電気電子工学科特別研究細則（入学年度ごとに規定）の要件を満たしていなければならない。			
[Method, Point of view, and Attainment levels of Evaluation]			
研究課題に対する理解度・演習実施状況、学士論文に対する口頭試問に基づき、総合的に評価する。なお、学士論文の作成にあたっては学士論文作成規定に従うこと。			
[Textbook]			
Not used			
[Reference books, etc.]			
(Reference books) 学士論文作成規定および手引を配付する。			
[Regarding studies out of class (preparation and review)]			
研究テーマに応じて自主的に学習することが求められる。			
(Others (office hour, etc.))			
*Please visit KULASIS to find out about office hours.			

応用電工学(2)	

Explain the principles of the conversion of chemical energy to electrical energy, fuel cells, rechargeable lithium batteries, and so on.	
6. Summary (feedback class)	
As well as summarizing the electrical generation methods we have studied, confirm the degree of learning attainment."	
[Class requirement]	
Basic circuit theory; Fundamental physics and chemistry	
[Method, Point of view, and Attainment levels of Evaluation]	
Final examination or homeworks in the term.	
[Textbook]	
Handouts.	
[Reference books, etc.]	
(Reference books)	
[Regarding studies out of class (preparation and review)]	
Students are advised to review class material using documents, etc.	
(Others (office hour, etc.))	
*Please visit KULASIS to find out about office hours.	

Numbering code			
Course title <English>	グラフ理論（電気電子） Graph Theory	Affiliated department, Job title, Name	Academic Center for Computing and Media Studies Associate Professor.MIYAZAKI SHIYUICHI
Target year	3rd year students or above	Number of credits	2
		Course offered year/period	2019/Second semester
Day/period	Thu.4	Class style	Lecture
		Language	Japanese
[Outline and Purpose of the Course]			
We learn basic theories of graphs and their applications, and fundamental algorithms for solving graph problems.			
[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 Schedule and Contents]			
1. Foundations of Graphs and (4 timeslots) I explain definition of graphs and basic properties of graphs. I also briefly review the basics of algorithms and their complexity.			
2. Minimum spanning trees (1 timeslot) Kruskal's algorithm, Prim's algorithm, Steiner tree problem.			
3. Shortest path problems (1 timeslot) Dijkstra's algorithm.			
4. Euler circuits and Hamiltonian cycles (2 timeslots) Euler circuits, Hamiltonian cycles, Dirac's theorem. Ore's theorem.			
5. Graph coloring (2 timeslots) Vertex coloring and edge coloring. Brooks's theorem, Vizing's theorem, Konig's theorem. Coloring maps.			
6. Maximum flow problems (2 timeslots) Ford-Fulkerson's algorithm.			
7. Matching (2 timeslots) Matchings, in particular, bipartite matchings. Hall's theorem, Hungarian method.			
8. Exam (1 timeslot)			
[Class requirement]			
Basics of algorithms, data structures, and set theory.			
[Method, Point of view, and Attainment levels of Evaluation]			
Mainly evaluated by the final exam. In some cases, exercises or the number of attendance to the class may be			
----- Continue to グラフ理論（電気電子）(2)			

グラフ理論 (電気電子) (2)

considered.

[Textbook]

宮崎修一 『グラフ理論入門 - 基本とアルゴリズム - 』 (森北出版株式会社) ISBN:978-4-627-85281-5 (Written in Japanese)

[Reference books, etc.]

(**Reference books**)

I may show some recommended books in class.

[Regarding studies out of class (preparation and review)]

Reading the textbook is effective for study. Due to time constraints, I do not give complete description of the proofs in class. I strongly recommend do it by yourself after the class.

(**Others (office hour, etc.)**)

*Please visit KULASIS to find out about office hours.