科目コード (Code)	科目名 (Course title)	Course title (English)
10C643	電気工学特別実験及演習１	Advanced Experiments and Exercisesin Electrical Engineering I
10C646	電気工学特別実験及演習２	Advanced Experiments and Exercisesin Electrical Engineering II
10C628	状態方程式論	State Space Theory of Dynamical Systems
10C604	応用システム理論	Applied Systems Theory
10C601	電気数学特論	Applied Mathematics for Electrical Engineering, Adv.
10C647	電気電磁回路論	Electrical and Electromagnetic Circuits
10C610	電磁気学特論	Electromagnetic Theory, Adv.
10C613	超伝導工学	Superconductivity Engineering
10C614	生体機能工学	Biological Function Engineering
10C625	電気回路特論	Theory of Electric Circuits, Adv.
10C631	制御系設計理論	Design of Control Systems
10C611	電磁界シミュレーション	Computer Simulation of Electrodynamics
10C612	宇宙電波工学	Space Radio Engineering
10C617	マイクロ波応用工学	Applied Microwave Engineering
10C714	時空間メディア解析特論	Spacio-tempral Data Analysis for Multimedia
10C716	可視化シミュレーション学	Visualized Simulation Technology
693622	ディジタル通信工学	Digital Communications Engineering
693628	情報ネットワーク	Information Networks
10X001	融合光･電子科学の展望	Prospects of Interdisciplinary Photonics and Electronics
10C718	電気工学特別研修１(インターン)	Advanced Seminar in Electrical EngineeringI
10C720	電気工学特別研修２(インターン)	Advanced Seminar in Electrical EngineeringII

未更新

Numbering code			
Course title <English>	電気工学特別実験及演習 1 Advanced Experiments and Exercises in Electrical Engineering I	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI

Target year		Number of credits	4	Course offered year/period	2019/Intensive, year-round
Day/period	Intensive	Class style	Experiment	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,30times,

[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.

未更新

Numbering code			
Course title <English>	電気工学特別実験及演習２ Advanced Experiments and Exercises in Electrical Engineering II	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI

Target year		Number of credits	4	Course offered year/period	2019/Intensive, year-round
Day/period	Intensive	Class style	Experiment	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,30times,

[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.

Numbering code			
Course title <English>	状態方程式論 State Space Theory of Dynamical Systems	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Associate Professor,EBIHARA YOSHIO

Target year		Number of credits	2	Course offered year/period	2019/First semester

Day/period	Wed.3	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

The course deals with the dynamical system theory based on linear time-invariant state equations. It covers such topics as state equations, controllability and observability, mode decomposition and its relevance to controllability/observability, stability of dynamical systems, and the Kalman canonical decomposition.

[Course Goals]

To acquire the knowledge on the basic theory for linear system analysis by means of state equations.

[Course Schedule and Contents]

Feedback systems and state equations (3-4 weeks)

Fundamentals of state equations, their relationship to transfer functions and block diagram representations.

Responses of linear systems (5-6 weeks)

State transition matrices, equivalence transformation of systems, mode decomposition, and Lyapunov stability.

Controllability and observability (5-6 weeks)

Controllability and observability, mode decomposition and its relevance to controllability/observability, controllable subspace and unobservable subspace, and the Kalman canonical decomposition. Checking degrees of understanding of all the lecture topics closes the class.

[Class requirement]

Classical control theory (in terms of transfer functions), linear algebra and calculus.

[Method, Point of view, and Attainment levels of Evaluation]

The grading will be based on the exam.

[Textbook]

Handouts will be given at the class.

[Reference books, etc.]

（Reference books）

Continue to 状態方程式論(2)↓↓↓

状態方程式論(2)

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

Regular review using lecture notes and the handouts is presupposed.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	応用システム理論 Applied Systems Theory	Affiliated department, Job title,Name	Institute for Liberal Arts and Sciences Associate Professor,TANAKA SHIYUNJI Graduate School of Engineering Associate Professor,SAKAMOTO TAKUYA

Target year		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 deals with mathematical methods of system optimization mainly for combinatorial optimization problems. It covers such topics as the integer optimization and its typical problems, exact solution methods including the dynamic programming and the branch and bound method, approximate solution methods including the greedy method, meta-heuristics including the genetic algorithms, the simulated annealing method, and the tabu search.

[Course Goals]

To acquire the knowledge on formulation of combinatorial optimization problems into integer programming problems, basic concepts, algorithms, characteristics, and application procedures of exact solution methods, approximate solution methods, and meta-heuristics.

[Course Schedule and Contents]

1. Combinatorial optimization problems and complexity (1-2 weeks)
- necessity and importance of combinatorial optimization, typical problems, complexity, classes P and NP, complexity of combinatorial optimization problems, limitation of exact solution methods, necessity of approximate solution methods and meta-heuristics

2. Exact solution methods (3 weeks)
- Principle of Optimality, dynamic programming, branch-and-bound method, and their applications

3. Integer programming (2-3 weeks)
- formulation as integer programming problem, relaxation problem, and cutting plane algorithm

4. Approximate solution methods (1-2 weeks)
- greedy method, relaxation method, partial enumeration method, etc.

5. Meta-heuristics (4-5 weeks)
- local search, basic ideas of meta-heuristics, iterated local search, variable neighborhood search, genetic algorithms, simulated annealing method, tabu search, etc.

6. Multi-objective optimization (1-2 weeks)
- importance of multi-objective optimization, theoretical backgrounds, and solution methods.

Continue to 応用システム理論(2)↓↓↓

応用システム理論(2)

[Class requirement]

linear programming, nonlinear programming

[Method, Point of view, and Attainment levels of Evaluation]

In principle, the grading will be based on the absolute and comprehensive evaluation of the reports on the subjects given in the class.

[Textbook]

Not used
No textbook is used.
Handouts will be provided during class.

[Reference books, etc.]

（Reference books）

M. Fukushima: Introduction to Mathematical Programming (in Japanese), Asakura, 1996.
Y. Nishikawa, N. Sannomiya, and T. Ibaraki: Optimization (in Japanese), Iwanami, 1982.
M. Yagiura, and T. Ibaraki: Combinatorial Optimization ---With a Central Focus on Meta-heuristics--- (in Japanese), Asakura, 2001.
B. Korte, and J. Vygen: Combinatorial Optimization ---Theory and Algorithms, Third Edition, Springer, 2006.

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

Students are expected to review the class and try various methods by themselves.

（Others (office hour, etc.)）

Handouts and exercises are given at the class.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	電気数学特論 Applied Mathematics for Electrical Engineering, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Professor,DOI SHINJI Graduate School of Engineering Professor,HIKIHARA TAKASHI

Target year		Number of credits	2	Course offered year/period	2019/First semester
Day/period	Thu.1	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

In the class, fundamental mathematics is lectured for electrical engineering, electronics, system engineering, and material science. In particular, system theory, nonlinear dynamics, and particle dynamics in force field can be discussed with mathematical clear image.

[Course Goals]

Professors expect students to model their system and analyze the models theoretically. Students will be requested to understand their system in principle mechanics and control them based on system theory.

[Course Schedule and Contents]

Introduction 1 1 Several examples of linear operators encountered in electrical engineering, e.g. in quantum mechanics are explained. Then, Linear vector space is reviewed and linear dynamical system is introduced.
Fundamentals of linear vector space 2-4 Direct sum decomposition, projection operator, and the structure of vector spaces such as Jordan normal form are explained.
Linear dynamical system 3-5 On the basis of the knowledge of the vector space, linear dynamical systems theory is explained as a simple application of vector spaces.
Introduction 2 1 The introduction to nonlinear dynamics will be explained based on oscillation theory.
Hamiltonian mechanics 1-3 Hamiltonian mechanics is lectured on linear symplectic space.
Manifold and vector field 2-4 Manifold is discussed in nonlinear system with relation to vector filed analysis.

[Class requirement]

Linear algebra

[Method, Point of view, and Attainment levels of Evaluation]

Students are requested to reply to report assignments. The grading is based on the evaluation of the reports.

[Textbook]

Not used

[Reference books, etc.]

（Reference books）

S. Wiggins 『Introduction to Applied Nonlinear Dynamical Systems and Chaos』 （Springer-Verlag）

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

https://www.t.kyoto-u.ac.jp/lecturenotes/gse/kueeng/10C601/syllabus

（Others (office hour, etc.)）

Appropriate references will be shown in classes. Thursday 1st class hour is due from April 13th.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	電気電磁回路論 Electrical and Electromagnetic Circuits	Affiliated department, Job title,Name	Graduate School of Engineering Professor,WADA OSAMI

Target year		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]

[Course Goals]

[Course Schedule and Contents]

Guidance,1time,
Circuit description including electromagnetic coupling effects,2times,
Evaluation and description methods for high-frequency circuits,2times,
Transmission line and its characteristics (1) ,2times,
Transmission line and its characteristics (2) ,2times,
Description of electromagnetic couplings,2times,
E-system integrity design technology for electric and electronic systems,3times,
Final exam and feedback,1time,

[Class requirement]

None

[Method, Point of view, and Attainment levels of Evaluation]

[Textbook]

Materials for this course will be distributed at the lectures.

[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>	電磁気学特論 Electromagnetic Theory, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Professor,MATSUO TETSUJI

Target year		Number of credits	2	Course offered year/period	2019/Second semester

Day/period	Wed.3	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

The first half: the special theory of relativity and the covariance of Maxwell's equations
The latter half: the differential form in the electromagnetic field theory and its application to computational electromagnetics

[Course Goals]

1. Understanding of the basic concepts of special theory of relativity and the covariant formulation of Maxwell#039s equations
2. Understanding of the basics of differential form in electromagnetic field theory

[Course Schedule and Contents]

Introduction to special theory of relativity: 2-3times
- Galilean relativity and special relativity
- Lorentz transformation

Tensor representation and relativistic dynamics: 2-3times
- Introduction to tensor representation
- Relativistic dynamics

Covariant formulation of Maxwell's equations: 2-3times
- Electromagnetic field tensor
- Lorentz covariance of Maxwellrsquos equations

Differential form in electromagnetic field theory: 3-4times
- Basics of differential form in electromagnetic field theory

Application to computational electromagnetics: 3-4times
- Application of integral form of Maxwell's equations to computational electromagnetics

[Class requirement]

Basic electromagnetic theory

[Method, Point of view, and Attainment levels of Evaluation]

Submission of reports (twice)

Continue to 電磁気学特論(2)↓↓↓

電磁気学特論(2)

[Textbook]

Not used

[Reference books, etc.]

（Reference books）

Y. Kazama, Introductory Lectures on the Theory of Relativity (in Japanese), Baifukan,1997.

[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>	超伝導工学 Superconductivity Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Program-Specific Professor,NAKAMURA TAKETSUNE Graduate School of Engineering Professor,AMEMIYA NAOYUKI

Target year		Number of credits	2	Course offered year/period	2019/First semester

Day/period	Mon.4	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

TBD

[Course Goals]

TBD

[Course Schedule and Contents]

,1time,
,3～4times,
,2～3times,
,3～4times,
,2～3times,
,1～2times,

[Class requirement]

None

[Method, Point of view, and Attainment levels of Evaluation]

TBD

[Textbook]

Not used

[Reference books, etc.]

（Reference books）
電気学会 『超電導工学』

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

TBD

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	生体機能工学 Biological Function Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,KOBAYASHI TETSUO Graduate School of Engineering Assistant Professor,OIDA TAKENORI

Target year		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]

The course provides basic knowledge of biological function engineering, in particular, human brain functions.

[Course Goals]

To understand basic knowledge of neuroimaging techniques and human brain functions.

[Course Schedule and Contents]

Basics of nervous system,2times,Study about detail structure of the human brain to understand higher brain functions. In particular, learn about cortical structure and functional map.
Neurones and glial cells,1time,Study about detail structures and functions of neuron and glial cells.
Neuroimaging techniques,3times,Study about measurement principles and analytical methods of representative non-invasive neuro-imaging techniques.
Sensory functions,2times,Study about organizations of sensory systems such as visual, auditory and somatosensory systems.
Motor functions,1time,Study about organizations and functions of primary motor, premotor and supplementary motor areas.
Magnetic Resonance Imaging and its Application,3times,Study about basic principle and pulse sequences of magnetic resonance imaging (MRI) and its application.
Practice of MRI,2times,Practice of MRI acquisition of the head as well as image processing of the MRI data.
Evaluation of understanding,1time,We are going to check students#039 achievement by answering questions from students.

[Class requirement]

Electricity and magnetism, Fundamentals of biomedical engineering

[Method, Point of view, and Attainment levels of Evaluation]

A report is given in the class for evaluating the level of understanding of the fundamentals of biological function engineering. Rating is based on the comprehensive evaluation of the reports.

[Textbook]

Not used

[Reference books, etc.]

（Reference books）
Introduced during class
e.g.,

Continue to 生体機能工学(2)↓↓↓

生体機能工学(2)

Tetsuo Kobayashi, Isamu Ozaki and Ken Nagata (eds.): Brain topography and multimodal imaging, (Kyoto Univ. Press, 2009)

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

Review handouts provided in the class or materials uploaded on a webpage in KULASIS.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	電気回路特論 Theory of Electric Circuits, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor,HISAKADO TAKASHI

Target year		Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Mon.2	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

Introduction,1time,
Modeling by circuit,4times,
Circuit equation,4times,
Phenomena in circuit,3times,
Property of circuit,2times,
Achievement test,1time,

[Class requirement]

None

[Method, Point of view, and Attainment levels of Evaluation]

Reports

[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.

Numbering code			
Course title <English>	制御系設計理論 Design of Control Systems	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI Graduate School of Engineering Associate Professor,EBIHARA YOSHIO

Target year		Number of credits	2	Course offered year/period	2019/Second semester

Day/period	Tue.2	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

The course is based on State Space Theory of Dynamical Systems, and provides the applications of the concepts given therein to systematic control system design. The course covers such topics as state feedback and pole assignment, observers, synthesis of feedback control systems, servo conditions and feedforward, and optimal control under quadratic performance indices.

[Course Goals]

To understand the basic ideas of control system design based on state space representations, and acquire fundamental knowledge and skills on practical control system design through simulated experiences with the report subjects.

[Course Schedule and Contents]

Pole assignment by state feedback (4-5 weeks)

State feedback, controllable canonical forms and pole assignment of scalar/multivariable systems, computation of the state feedback gains for pole assignment, transient responses, uncontrollable poles and stabilizability.

Observers (3-4 weeks)

Observable canonical forms and observability conditions, full-order observer, minimal-order observer, conditions for observers and observer-based feedback.

Synthesis of feedback systems (2-3 weeks)

Feedback systems with integral compensation, servo systems, internal model principle, synthesis of servo systems.

Optimal control under quadratic performance index (3-4 weeks)

Optimal regulators and their closed-loop poles, Riccati equations and their solutions, relationship with the pole assignment problem. Checking degrees of understanding of all the lecture topics closes the class.

[Class requirement]

The contents given in State Space Theory of Dynamical Systems, and linear algebra.

Continue to 制御系設計理論(2)↓↓↓

制御系設計理論(2)

[Method, Point of view, and Attainment levels of Evaluation]

In principle, the grading will be based on the absolute and comprehensive evaluation of the reports on the subjects given in the class. Should this change due to inadequate efforts on the submitted reports, an exam might be also imposed, in which case the details will be announced at the class at least two weeks before the exam term.

[Textbook]

Handouts will be given at the class.

[Reference books, etc.]

（Reference books）

（Related URLs）

((Info) http://www-lab22.kuee.kyoto-u.ac.jp/~hagiwara/ku/matlab-octave.html)

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

Regular review using lecture notes and the handouts is presupposed.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	電磁界シミュレーション Computer Simulation of Electrodynamics	Affiliated department, Job title,Name	Research Institute for Sustainable Humanosphere Professor,OOMURA YOSHIHARU Research Institute for Sustainable Humanosphere Associate Professor,EBIHARA YUUSUKE

Target year		Number of credits	2	Course offered year/period	2019/First semester

Day/period	Tue.5	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

Variables and Classification of Simulation Codes,1time,
Finite Difference Methods,1time,
Difference Form of Maxwell#039s Equation and Grid Assignment / Time Step Chart,1time,
Courant Condition,1time,
Electromagnetic Radiation from a Thin Current,1time,
Buneman-Boris Method for Equation of Motion (Relativistic Eqs.),1time,
Interporation of Electromagnetic Field,1time,
Computatin of Charge and Current Densities, Self-force Cancellation,1time,
Initilization of Particles and Fields,1time,
Renormalization and Diagnostics,1time,
Advection/Wave Equation for 1D Case (FTCS, Lax, Upwind and Lax-Wendroff Methods),1time,
von Neumann Stability Analysis,1time,
Limiter Function,1time,
Advection/Wave Equation for Multi-Dimensional Case,1time,
Vlasov Equation,1time,

[Class requirement]

Electrodynamics, Vector Analysis, Computer Language

[Method, Point of view, and Attainment levels of Evaluation]

Continue to 電磁界シミュレーション(2)↓↓↓

電磁界シミュレーション(2)

[Textbook]

[Reference books, etc.]

（Reference books）

(1) H. Matsumoto and Y. Omura, Computer Space Plasma Physics: Simulation Techniques and Softwares, Terra Scientific, Tokyo, 1993. \(2) H. Usui and Y. Omura, Advanced Methods for Space Simulations, Terra Pub, 2007.

[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>	宇宙電波工学 Space Radio Engineering	Affiliated department, Job title,Name	Research Institute for Sustainable Humanosphere Professor,KOJIMA HIROTSUGU

Target year		Number of credits	2	Course offered year/period	2019/Second semester

Day/period	Tue.3	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

The present lecture provides the guideline how the technology on the electronics is used in spacecraft and space systems. In particular, we give how space environments affect spacecraft design in the view points of radiations, and spacecraft charging. The lecture also provides the design of onboard components such as power, communication, and attitude control systems.

[Course Goals]

Mastery of the way how we can make use of the knowledges of the physics and technology to the space engineering.

[Course Schedule and Contents]

Space environment and its impacts to spacecraft design,5-6times,
The space environment and its impacts to the design of spacecraft in the view point of spacecraft design such as radiations, plasma, and spacecraft charging.

Power,2times,Power source and system on board spacecraft.

Electromagnetic Compatibility of spacecraft,1time,Electromagnetic Compatibility in the view point of spacecraft designs

Thermal design of spacecraft,1-2times,Introduction of the thermal design of spacecraft systems to keep proper temperatures inside spacecraft in space.

Communication and commands,2times,Communication system between Earth and spacecraft including command/House Keeping system.

Attitude control system, **1** times,Introduction of attitude control systems of spacecraft.

History of rockets,1time,History of the development of rockets.
Feedback,1time,Questions are accepted via e-mails during the feedback week.

[Class requirement]

Plasma physics, Electromagnetics. Radio engineering, Electronics

Continue to 宇宙電波工学(2)↓↓↓

宇宙電波工学(2)

[Method, Point of view, and Attainment levels of Evaluation]

attendance and final examination.

[Textbook]

Not used

[Reference books, etc.]

（Reference books）

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

Review the notes that are taken during the lecture.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	マイクロ波応用工学 Applied 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		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]

This lecture picks up microwave power transmission (MPT) technology, rectifying antenna (rectenna), antenna and propagation for the MPT, microwave transmitters, and some MPT applications like the Space Solar Power Satellite/Station. This lecture also picks up the other wireless power transmission technologies like resonnance coupling, energy harvesting, and applied microwave technologies of microwave processing, wireless communications, and radar.

[Course Goals]

Students learn about applied microwave engeering, mainly microwave power transmission.

[Course Schedule and Contents]

Introduction,1time,The purpose and constitution of the lecture, and review of microwave engineering are explained.
Applications of Wireless Power Tramsmission,3-4times,Space Solar Power Satellite/Station and Ubiquitous power source as applications of microwave power transmission, the resonance coupling and energy harvesting as the other battery-less technologies are explained.
rectifying antenna (rectenna),1-2times,rectifying antenna (rectenna) for the MPT are explained.
antenna and propagation for the MPT,5-6times,Calculation of beam collection efficiency and beam propagation with FDTD method are explained. Phased array technologies, beam targetting method, non linear physics of microwave-plasma interation are overviwed.
Microwave transmitters,2times,High efficient semi-conductor amplifiers and microwave tubes are explained.
microwave processing, wireless communications, and radar,2times,Microwave processing, wireless communications, and radar texhnologies are explained.

[Class requirement]

Microwave engineering

[Method, Point of view, and Attainment levels of Evaluation]

Reports

[Textbook]

Naoki Shinohara 『Solar Power Satellite (in Japanese), 』 （Ohm Publishing）ISBN:978-4-274-21233-8

[Reference books, etc.]

（Reference books）

Naoki Shinohara 『Wireless Power Transfer via Radiowaves』 （Wiley - ISTE）ISBN:978-1-84821-605-1

Continue to マイクロ波応用工学(2)↓↓↓

マイクロ波応用工学(2)

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

A student should read text book before/after class.

（Others (office hour, etc.)）

Number of the lectures may change.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	時空間メディア解析特論 Spacio-tempral Data Analysis for Multimedia	Affiliated department, Job title,Name	Academic Center for Computing and Media Studies Professor,NAKAMURA YUUICHI

Target year		Number of credits	2	Course offered year/period	2019/First semester
Day/period	Tue.3	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

Representation, feature extraction, recognition of media with two or higher dimensions, especially images and videos, are explained with comparing to human vision and biological systems.

[Course Goals]

To learn the basic of representation, feature extraction, and pattern recognition of signals with two or higher dimension, and their applications.

[Course Schedule and Contents]

Spatio-Temporal Media,1time,What is spatio-temporal media. Some examples.
Light and Colors,1-2times,Intensity, colors, and spectrum in image media.
Features and Segmentation,2times,Features such as edge, region, etc. for analysing image media.
Filtering and Wavelet Transform,1-2times,Introduction to filtering and Wavelet Transform.
Discrete Wavelet Transform and Applications,1-2times,Dicrete Wavelet Transform and applications such as image enhancement, image compression, etc.
Geometry of Image Capturing,1-2times,The mechanism and geometry of image capturing: projection of a 3D world into 2D images.
3D Measurements and Reconstruction,2times,3D measurements and 3D world reconstrunction from a set of 2D images.
Measurement of Motions,1-2times,Motion detection and measurement, and oject tracking.
Pattern Recognition,0-2times,The basic idea of pattern recognition and usuful tools such as Support Vector Machine.

[Class requirement]

Fundamental knowledge of digital signal processing

[Method, Point of view, and Attainment levels of Evaluation]

Evaluation is based on participation and reports.

[Textbook]

No specific textbooks. Handouts will be given when necessary.

Continue to 時空間メディア解析特論(2)↓↓↓

時空間メディア解析特論(2)

[Reference books, etc.]

（Reference books）

Computer Vision: A Modern Approach, Forsyth and Ponce, Prentice Hall

（Related URLs）

(Please see PandA (https://panda.ecs.kyoto-u.ac.jp/portal).)

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

（Others (office hour, etc.) ）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	可視化シミュレーション学 Visualized Simulation Technology	Affiliated department, Job title,Name	Academic Center for Computing and Media Studies Professor,KOYAMADA KOUJI Academic Center for Computing and Media Studies Program-Specific Senior Lecturer,NATSUKAWA HIROAKI

Target year		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]

[Course Goals]

[Course Schedule and Contents]

,1time,
,2-3times,
,1-2times,
,1-2times,
,2-3times,
,2-3times,
,1-2times,
,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.

未更新

Numbering code			
Course title <English>	融合光・電子科学の展望 Prospects of Interdisciplinary Photonics and Electronics	Affiliated department, Job title,Name	Graduate School of Engineering Professor,FUJITA SHIZUO

Target year		Number of credits	2	Course offered year/period	2019/First semester
Day/period	Fri.2	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,,

[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.

未更新

Numbering code			
Course title <English>	電気工学特別研修１(インターン) Advanced Seminar in Electrical EngineeringI	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI

Target year		Number of credits	2	Course offered year/period	2019/First semester
Day/period	Thu.3,4,Fri.3,4	Class style	Practical training	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,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.

未更新

Numbering code			
Course title <English>	電気工学特別研修２(インターン) Advanced Seminar in Electrical EngineeringII	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HAGIWARA TOMOMICHI

Target year		Number of credits	2	Course offered year/period	2019/First semester
Day/period	Thu.3,4,Fri.3,4	Class style	Practical training	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,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.

Numbering code	G-INF06 53622 LJ72　G-INF06 53622 LJ11				
Course title <English>	ディジタル通信工学 Digital Communications Engineering		Affiliated department, Job title,Name	Graduate School of Informatics Professor,HARADA HIROSHI	
Target year	1st year students or above	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Mon.2	Class style	Lecture	Language	Japanese
Class type	専攻基礎科目				

[Outline and Purpose of the Course]

ディジタル情報伝送における基本的事項である変復調方式、無線多重伝送方式、無線アクセス方式などについて述べるとともに、これらの技術が実際の無線通信システムでどのように使われているか説明する。特に，MIMO-OFDM**に代表される各種のマルチパス・フェージング対策技術や高能率ブロードバンド無線通信など最近の動向についても紹介する。**

This course explains fundamental concepts concerning a digital-information transmission technique such as modulation and demodulation schemes, wireless multiplexing transmission schemes, wireless access schemes. Later, it discusses how these techniques are applied to real wireless communication systems. Lastly, it introduces representative anti-multipath fading techniques, convolutional coding, maximum likelihood decoding, highly-efficient broadband radio transmission technologies, and the recent technical trend of broadband wireless communications.

[Course Goals]

・ディジタル通信技術の歴史と動向を理解し、問題点がどこにあるのか、その解決策は何かを把握する。
・ディジタル変復調方式に関する基本事項を理解する。
・無線通信で用いられる代表的な符号化方式、復号方式を理解する。
・現在の無線通信システムの標準化動向について基本的な項目を理解する。

[Course Schedule and Contents]

1. **ディジタル通信技術の歴史と動向（１回）：ディジタル通信技術の歴史と最近の動向について紹介する。**
2. **ディジタル変復調（３回）：ディジタル変復調技術について体系的に講述する。代表的な復調方式とビット誤り率の計算法について説明する。**
3. **無線多重伝送方式、無線アクセス方式（３回）：無線多重伝送方式（**OFDM、CDM**）、無線アクセス方式（**OFDMA、CDMA**）について体系的に講述する。**
4. **マルチパス・フェージング対策技術（１回）：等化技術、ダイバーシチ等のマルチパス・フェージング技術について体系的に講述する。**
5. **たたみ込み符号と最尤系列推定復号（１回）：たたみ込み符号と最尤復号アルゴリズムとして知られているヴィタビ・アルゴリズムについて説明する。**
6. **高能率ブロードバンド無線通信伝送技術（１回）：**MIMO**伝送技術等の高能率ブロードバンド無線伝送技術について述べる。**
7. **セルラー方式移動通信システムの原理（３回）：セルラー方式移動通信の原理並びに第１世代、第２世代の代表的な移動通信システムについて述べる。**
8. **ブロードバンド無線伝送技術（１回）：第３世代および第４世代移動通信の技術動向、**IEEE802

Continue to ディジタル通信工学(2)↓↓↓

ディジタル通信工学(2)

無線LAN、無線PANについて説明する。

1. Trend of digital communication techniques (once): Recent technical trend of digital communications is introduced.
2. Digital modulation/demodulation (3 times): Digital modulation/demodulation schemes are explained. Typical demodulation schemes together with associated BER formulae are also discussed.
3. Wireless multiplexing transmission schemes and wireless access schemes (3 times): Wireless multiplexing transmission schemes such as OFDM and CDM and wireless access scheme such as OFDMA, CDMA are explained.
4. Anti-multipath fading technologies (once): Anti-multipath fading technologies such as equalization and diversity techniques are explained
5. Convolutional coding and maximum likelihood decoding (once): Convolutional codes and associated decoding algorithm known as Viterbi algorithm are explained.
6. Highly-efficient broadband radio transmission technologies (once): Highly-efficient broadband radio transmission technologies such as MIMO techniques are explained.
7. Principles of cellular mobile radio (3 times): Principle of cellular mobile radio together with 1st and 2nd generation cellular systems are explained. Urban radio propagation characteristics and typical counter-measure techniques against multipath fading are discussed.
8. Broadband wireless access (once): Broadband wireless access techniques in 3rd and 4th generation mobile communication systems and IEEE 802 based wireless LAN and PAN(Personal Area Network) systems are discussed.

[Class requirement]

情報伝送にかかわる基礎知識を習得していること。

Fundamental knowledge of information transmission techniques is assumed.

[Method, Point of view, and Attainment levels of Evaluation]

講義で講述したディジタル通信技術にかかわる基本的な概念の理解度を、主として定期試験により評価する。ただし、とき折りレポートの提出を求め、成績に加味することがある。

Students are evaluated by a written exam to what extent they have understood the fundamental concepts and techniques regarding digital communications explained during the lectures. Some additional reports might be requested to submit, which might be used as supplement to the written exam.

[Textbook]

Not used
（プリント配布予定）

Course materials will be distributed during the lecture.

[Reference books, etc.]

（Reference books）
Introduced during class

Continue to ディジタル通信工学(3)↓↓↓

ディジタル通信工学(3)

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

授業前に予習は必要ないが、復習を十分に行い、各回の講義で解説した技術間の関係を十分に理解すること。

（Others (office hour, etc.)）

質問等は随時受け付ける。ただし事前にメールでアポイントを取ること。

Questions are welcome anytime. Please make an appointment by e-mail.

*Please visit KULASIS to find out about office hours.

Numbering code	G-INF06 53628 LJ72　G-INF06 53628 LJ11		
Course title <English>	情報ネットワーク Information Networks	Affiliated department, Job title,Name	Graduate School of Informatics Professor,Oki Eiji Graduate School of Informatics Associate Professor,SHINKUMA RIYOUICHI

Target year	1st year students or above	Number of credits	2	Course offered year/period	2019/First semester

Day/period	Tue.2	Class style	Lecture	Language	Japanese

Class type	専攻基礎科目

[Outline and Purpose of the Course]

情報ネットワークをデザインするための各種基本アーキテクチャとそれらを支える基礎技術を取り扱う。具体的には、回線交換やパケット交換による交換ネットワーク、IP(Internet Protocol)など代表的プロトコルについて解説する。また、オーバレイネットワークやモバイルネットワークといったアプリケーションについても論じる。

This course introduces fundamental architectures and technologies for the design of information networks, which include circuit switching or packet switching based networks and communication protocols such as internet protocol (IP). Overlay networks and mobile networks are also discussed as their applications.

[Course Goals]

生活基盤としての通信ネットワーク、社会経済基盤としてのネットワークアプリケーションについて、本学情報学研究科修了生として習得しておくべき知識と論理について自分で説明できるようになる。

Through this course, students could obtain and explain the knowledge, required for them after their graduations, about communication networks as our life infrastructure and application networks as our social and economic infrastructure.

[Course Schedule and Contents]

1. プロトコル、伝送システム、情報ネットワークの技術史(2回)
2. IP(Internet Protocol)ネットワークのアプリケーション層、データリンク層、ネットワーク層、ルーティング & モバイル、トランスポート層(5回)
3. オーバレイネットワーク、QoS/QoE、セルラーネットワークのデザイン(3回)
4. 研究開発と特許戦略(1回)
5. トラヒック理論の基礎(1回)
6. 復習、演習、学習到達度の確認(3回)

1. Communication protocols, transmission systems, history of information networks
2. Internet protocol (IP) network protocols: application, data-link, network, routing/mobile, and transport protocols
3. Designs of overlay networks, QoS/QoE techniques, cellular networks
4. Research & development and patent strategy
5. Fundamental traffic theory
6. Reviews, exercises, and small tests

Continue to 情報ネットワーク(2)↓↓↓

情報ネットワーク(2)

[Class requirement]

予備知識：ディジタル通信の基礎、確率統計の基礎について理解していること。

Students are expected to have fundamental knowledge about digital communication, probability theory, and statistics.

[Method, Point of view, and Attainment levels of Evaluation]

通信ネットワークとネットワークアプリケーションについての知識の習得度を期末試験と小テスト(2回程度)で評価する。

Students are evaluated about how much they understand the knowledge about communication networks and network applications according to the results of the semester and a couple of small tests

[Textbook]

Not used
資料は毎回配布する。

[Reference books, etc.]

（Reference books）
Tanenbaum 『Computer Networks』（ピアソンエデュケーションPrentice Hall）ISBN:4-89471-113-30-13-038488-7

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

予備知識：ディジタル通信の基礎、確率統計の基礎について理解していること。

Students are expected to have fundamental knowledge about digital communication, probability theory, and statistics.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.