科目コード (Code)	科目名 (Course title)	Course title (English)
10G001	応用数値計算法	Applied Numerical Methods
10G003	固体力学特論	Solid Mechanics, Adv.
10G005	熱物理工学	Thermal Science and Engineering
10G007	基盤流体力学	Introduction to Advanced Fluid Dynamics
10G009	量子物性物理学	Quantum Condensed Matter Physics
10G011	設計生産論	Design and Manufacturing Engineering
10G013	動的システム制御論	Dynamic Systems Control Theory
10G057	技術者倫理と技術経営	Engineering Ethics and Management of Technology
10G401	ジェットエンジン工学	Jet Engine Engineering
10G405	推進工学特論	Propulsion Engineering, Adv.
10G406	気体力学特論	Gas Dynamics, Adv.
10G409	航空宇宙システム制御工学	Aerospace Systems and Control
10G411	航空宇宙流体力学	Fluid Dynamics for Aeronautics and Astronautics
10C430	航空宇宙機力学特論	Advanced Flight Dynamics of Aerospace Vehicle
10G230	動的固体力学	Dynamics of Solids and Structures
10X411	複雑系機械システムのデザイン	Design of Complex Mechanical Systems
693431	力学系理論特論	Dynamical Systems, Advanced
693410	数理解析特論	Mathematical Analysis, Advanced
693320	非線形力学特論Ａ	Topics in Nonlinear Dynamics A
10M226	気象学Ⅰ	Meteorology I
10M227	気象学Ⅱ	Meteorology II
10G418	航空宇宙工学特別実験及び演習第一	Experiments and Exercises in Aeronautics and Astronautics I
10G420	航空宇宙工学特別実験及び演習第二	Experiments and Exercises in Aeronautics and Astronautics II

未更新

Numbering code			
Course title <English>	応用数値計算法 Applied Numerical Methods	Affiliated department, Job title,Name	Graduate School of Engineering Professor,INOUE YASUHIRO Graduate School of Engineering Associate Professor,TSUCHIYA TOSHIYUKI

Target year		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]

Numerical techniques, such as the finite element method and numerical control method, are indispensable in mechanical engineering. In this lecture, basics of numerical techniques which are required to study advanced methods for graduated students will be explained. The lecture will cover the linear system solution (Ax=b), eigenvalue analysis, interpolation approximation method, solutions of ordinary differential equation and partial differential equation. The programing exercise is included in this lecture.

[Course Goals]

Understandings of mathematical theories and programing implementations of the numerical methods.

[Course Schedule and Contents]

Introduction,1time,Introduction of this class\\Numerical representations and errors\\Macro programing using spread sheet applications
Linear system,1time,Matrix\\Norms\\Singular value decomposition
Linear simultaneous equation 1,2times,Solution of simultaneous linear equations\\direct method, iteration method
Eigenvalue analysis,2times,Eigenvalue problems
Interpolation ,2times,Interpolation and its errors
Numerical integra l ,2times,Numerical integration methods
Normal differential equation and numerical integral,1time,explicit method, implicit method\\ initial value problem, boundary value problem
Partial differential equation,3times,Differential expression of partial differential\\ Diffusion equation, wave equation\\Poisson equation, Laplace equation
Examination,1time,Feedback for homework and examination

[Class requirement]

Basic mathematics for undergraduates
Basic macro programing

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

Home works (four home works will be assigned) and examination.

Continue to 応用数値計算法(2)↓↓↓

応用数値計算法(2)

[Textbook]

Lecture note will be distributed through the course website.

[Reference books, etc.]

（Reference books）

Golub, G. H. and Loan, C. F. V., Matrix Computations, John Hopkins University Press\R.D.Richtmyer and K. W.Morton, Difference Methods for Initial-Value Problems, Second Edition, John Wiley amp Sons 1967

（Related URLs）

(Lecture notes, home works, and other info will be distributed through PandA: https://panda.ecs.kyoto-u.ac.jp)

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

Problems are based on macro on Microsoft Excel or LibreOffice.

（Others (office hour, etc.)）

Have a PC with Microsoft Excel with VBA or LibreOffice (https://ja.libreoffice.org/).

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	固体力学特論 Solid Mechanics, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HIRAKATA HIROYUKI Graduate School of Engineering Associate Professor,SHIMADA TAKAHIRO

Target year		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 provides fundamental concepts of solid mechanics such as stress, strain, and constitutive laws, and methods for analyzing stress/strain fields and deformation of solids and structures on the basis of the concepts. In particular, the course lectures theories of nonlinear problems such as plasticity and creep, and their numerical solutions, or finite element methods, which are important for design and development of mechanical structures.

[Course Goals]

Students will be able to:
understand solid mechanics deeply and acquire basic knowledge to design mechanical structures.
analyze problems of plasticity and creep by finite element methods.

[Course Schedule and Contents]

Introduction,1time,Overview of solid mechanics
Stress,1time,Cauchy stress tensor, Equilibrium equation, Invariants
Deformation,2times,Material description and spatial description, Displacement, Deformation gradient, Lagrange-Green strain and Euler-Almansi strain, Infinitesimal strain, Material time derivative
Constitutive equation: linear elasticity,1time,Linear elastic stress-strain response, Hookersquos law
Principle of virtual work and principle of minimum potential energy,1time,Principle of virtual work, Principle of minimum potential energy
Finite element method for linear elasticity,3times,Basis of finite element method, Finite element equilibrium equations, Elements, Numerical integration
Plasticity problems,3times,Plasticity theory (uniaxial and multiaxial problems, yield criteria, flow rule, hardening rule, constitutive equations), Finite element method for elasto-plastic problems
Creep problems,2times,Creep theory (uniaxial and multiaxial constitutive equations), Finite element method for creep problems
Summary,1time,Discussions and reports
Feedback,1time

[Class requirement]

This course requires basic knowledge of mechanics of materials and solid mechanics.

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

Grading is based on the examination, possibly with considerations of the homework reports.

[Textbook]

Lecture materials are distributed in the classroom.

Continue to 固体力学特論(2)↓↓↓

固体力学特論(2)

[Reference books, etc.]

（Reference books）

T. Kyoya, Continuum Mechanics, Morikita (2008) (in Japanese)\ Y. Tomita, ldquoFoundation and Application of Elastoplasticityrdquo Morikita (1995) (in Japanese)\ E. Neto et al., ldquoComputational Methods for Plasticity,rdquo John Wiley amp Sons (2008).

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

Preparation and review of lecture materials. Exercises.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	熱物理工学 Thermal Science and Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,YOSHIDA HIDEO Graduate School of Engineering Associate Professor,MATSUMOTO MITSUHIRO

Target year		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]

Several topics in advanced thermal physics are discussed. From microscopic view points, basics of stochastic process and related topics are given. From macroscopic ones, after the concept of entropy is revisited, applications in global enviroinments and hydrogen energy are described.

[Course Goals]

Microscopic Viewpoints: Ability of multi-scale modelling
Macroscopic Viewpoints: Ability of global environment modelling

[Course Schedule and Contents]

(M) Brownian Motion,1time,
(M) Transport Phenomena and Correlation Functions,1time,
(M) Spectral Analysis and Fractal Analysis,2times,
(M) Stochastic Process and Its Applications,3times,
(Y) Science of Atmosphere and Ocean,5times,
(Y) Science of Hydrogen Energy,1time,
(Y) Science of Nuclear Energy,1time,
Check and feedback,1time,

[Class requirement]

Elementary thermodynamics, Statistical physics, Heat transfer engineering, Numerical analysis etc.

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

Reports

[Textbook]

handout

[Reference books, etc.]

（Reference books）

Introduced during class

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

Not necessary

（Others (office hour, etc.)）

(2018)
Matsumoto: April 8 ~ May 227
Yoshida: June 3 ~ July 22

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	基盤流体力学 Introduction to Advanced Fluid Dynamics	Affiliated department, Job title,Name	Graduate School of Engineering Professor,INAMURO TAKAJI Graduate School of Engineering Professor,HANAZAKI HIDESHI Graduate School of Engineering Professor,TAKATA SHIGERU

Target year		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]

[Course Goals]

[Course Schedule and Contents]

, 5 times,
, 5 times,
, 4 times,
, 1 times,

[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>	量子物性物理学 Quantum Condensed Matter Physics	Affiliated department, Job title,Name	Graduate School of Engineering Professor,HASUO MASAHIRO Graduate School of Engineering Associate Professor,NAKAJIMA KAORU Graduate School of Engineering Senior Lecturer,SENAMI MASATO

Target year		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]

[Course Goals]

[Course Schedule and Contents]

,3times,
,3times,
,4times,
,1time,
,1time,
,1time,
,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)]

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	設計生産論 Design and Manufacturing Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Associate Professor,IZUI KAZUHIRO Graduate School of Engineering Senior Lecturer,BEAUCAMP, Anthony Tadeus Herve

Target year		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]

[Course Goals]

[Course Schedule and Contents]

,2times,
,2times,
,3times,
,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.

未更新

Numbering code			
Course title <English>	動的システム制御論 Dynamic Systems Control Theory	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI Graduate School of Engineering Professor,FUJIMOTO KENJI

Target year		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]

[Course Goals]

[Course Schedule and Contents]

,5times,
,5times,
,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.

未更新

Numbering code			
Course title <English>	技術者倫理と技術経営 Engineering Ethics and Management of Technology	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI Graduate School of Engineering Professor,TOMITA NAOHIDE Graduate School of Engineering Professor,KOMORI MASAHARU Graduate School of Engineering Professor,MATSUBARA ATSUSHI Graduate School of Engineering Associate Professor,TSUCHIYA TOSHIYUKI

Target year		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]

Basic knowledge of Engineering Ethics and Management of Technology needed for future project leaders in companies and society is taught. Students have to make group work after-class hours as well as presentations of wrapping-up the discussions. Engineering ethics is the field of applied ethics and system of moral principles that apply to the practice of engineering. The field examines and sets the obligations by engineers to society, to their clients, and to the profession. Management of Technology is a set of management disciplines that allows organizations to manage their technological fundamentals to create competitive advantage. This course consists of lectures, exercises, discussions and oral presentations under supervision of professional faculties and extramural lecturers.

[Course Goals]

To cultivate a spirit of self-sufficiency needed for engineers

[Course Schedule and Contents]

Engineering Ethics,9times,1. Introduction to Engineering Ethics (EE)\\2.Medical Engineering Ethics\\3.EE by Institution of Professional Engineers, Japan and abroad\\4.Product Safety and Product Liability\\5. Comprehensive Manufacturing and EE (1) \\6.Comprehensive Manufacturing and EE (2)\\7.Group Discussions\\8.History and Philosophy of EE\\9.Presentation on exercise of EE
Management of Technology,5times,1.Product Portfolio, Strategy for Competition\\2.Bussiness Domain and MOT for Marketing\\3. Organizational Strategy for Corporates#039 R amp D\\4. Management Theory for R amp D\\5.Presentation on exercise of MOT
Summary,1time,

[Class requirement]

Nothing particular

Continue to 技術者倫理と技術経営(2)↓↓↓

技術者倫理と技術経営(2)

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

Submission of reports and presentations

[Textbook]

No textbook

[Reference books, etc.]

（Reference books）

Nothing

（Related URLs）

(No Web Site)

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

（Others (office hour, etc.)）

Nothing particular

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	ジェットエンジン工学 Jet Engine Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor,IWAI HIROSHI

Target year		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]

The jet engine or gas turbine is one of the most advanced and sophisticated machines. Students will learn about its working principles, the history of development, the challenges for further development, and the direction of recent R&D, through lectures and group activity. They will also learn the system analysis of various heat engines.

[Course Goals]

Understand the fundamentals of jet engines and gas turbines and its history of developments. Understand advanced machine technology and research on the basis of the basic subjects of the undergraduate course. Master the cycle analysis of the heat engine with various losses.

[Course Schedule and Contents]

Week1, 2: Guidance, Fundamentals of Jet Engines and Gas turbines
Week3, 4: Fundamentals of aerodynamics
Week5: Thermodynamics in Jet Engines
Week6: Cycle analysis of heat engines with various losses
Week7: Intermediate exam. (Oral)
Week8-12: Group activity
Week13-15: Group presentations
Week16: Feedback

[Class requirement]

Thermodynamics, Fluid dynamics, Heat transfer, Material mechanics, Fundamentals of Materials (Undergraduate level)

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

Evaluation will be made on the basis of the reports, the results of the intermediate exam, the contents of the presentation and the quality of the presentation materials and discussions. Passing the oral exam is a requirement.

[Textbook]

Instructed during class

[Reference books, etc.]

（Reference books）

Introduced during class

Continue to ジェットエンジン工学 (2)↓↓↓

ジェットエンジン工学 (2)

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

Group activities require some degree of preparation outside the class.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	推進工学特論 Propulsion Engineering, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Professor,ERIGUCHI KOUJI

Target year		Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Fri.1	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,1time,
,2times,
,2times,
,4times,
,2times,
,2times,
,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)]

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	気体力学特論 Gas Dynamics, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Professor,TAKATA SHIGERU

Target year		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]

[Course Goals]

[Course Schedule and Contents]

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

[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>	航空宇宙システム制御工学 Aerospace Systems and Control	Affiliated department, Job title,Name	Graduate School of Engineering Professor,FUJIMOTO KENJI

Target year		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]

We introduce advanced system control theory of modern control based on state equation. In particular, lectures on nonlinear control, optimal control and application to control system design of mechatronics and spacecraft will be given.

[Course Goals]

To acquire modern control theory and nonlinear control useful for mechatronics and aerospace engineering.

[Course Schedule and Contents]

Three lectures on aerospace and control:
1. State-space equations, 2. Basics of variational methods, 3 Integrability and Forbenius' theorem

Four lectures on stability and dissipativity:
1. Lyapunov stability, 2. La Salle's invariance principle, 3. Lp stability, 4. Dissipativity

Four lectures on optimal control:
1. Optimal control, 2. Dynamic programming, 3. Maximum principle, 4. Control Lyapunov function and inverse optimality

Three lectures on nonlinear control synthesis:
1. Passivity and passivity theorem, 2. Hamiltonian systems and passivity based control, 3. Feedback linearization.

The last lecture gives a summary.

[Class requirement]

Dynamical Systems Control Theory

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

The score will be evaluated based on reports.

Continue to 航空宇宙システム制御工学(2)↓↓↓

航空宇宙システム制御工学(2)

[Textbook]

Not used

[Reference books, etc.]

（Reference books）

H. Khalil 『Nonlinear Systems』 （Prentice Hall）ISBN:9780130673893

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

Reports are asked for each unit. Review is necessary for each lecture.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	航空宇宙流体力学 Fluid Dynamics for Aeronautics and Astronautics	Affiliated department, Job title,Name	Graduate School of Engineering Associate Professor,OOWADA TAKU Graduate School of Engineering Senior Lecturer,SUGIMOTO HIROSHI Graduate School of Engineering Professor,INAMURO TAKAJI

Target year		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]

[Course Goals]

[Course Schedule and Contents]

,2times,
,3times,
,3times,
,4times,

[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>	航空宇宙機力学特論 Advanced Flight Dynamics of Aerospace Vehicle	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,AOI SHINYA Graduate School of Engineering Professor,SENDA KEI

Target year		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]

Flight Dynamics and Control of Aerospace Vehicles including Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechamics, etc.

[Course Goals]

To understand analytical mechanics through flight dynamics of aerospace vehicles: Basic items of Analytical Mechanics, Attitude Dynamics of Vehicles, Orbital Mechamics, etc.

[Course Schedule and Contents]

Analytical Mechanics,7times,1. Newton equations, 2. Lagrange equations, 3. Hamilton equations
Orbital Mechamics,4times,1. Motions in central force field, 2. Conservation law, 3. Orbit transition
Attitude Dynamics and Control,4times,1. Kinematics of rotation, 2. Attitude mechanics, 3. Stability analysis of equilibrium points, 4. Attitude Control

[Class requirement]

Foundation of mechanics and mathematics, Flight Dynamics of Aerospace Vehicle (Undergraduate)

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

Evaluation depends on marks of examination (approximately 80%) and exercises (approximately 20%). Both marks should be 60% or better.

[Textbook]

Instructed during class

[Reference books, etc.]

（Reference books）

L. D. Landau and E. M. Lifshitz 『Mechanics, Volume 1 (Course of Theoretical Physics) 』 （Elsevier） ISBN:0750628960
Herbert Goldstein 『Classical Mechanics』 （Addison-Wesley）ISBN:0201657023（international ed. ISBN 0321188977）
Toda 『Introductory course of physics 1 Mechanics』 （Iwnami Shoten）ISBN:4000076418（in Japanese）
Koide 『Introductory course of physics 2 Analytical Mechanics』 （Iwanami Shoten）ISBN:4000076426（in Japanese）
Wadachi 『Introductory course of physics 10 Mathematics for physics』 （Iwanami Shoten）ISBN: 4000076507（in Japanese）

Continue to 航空宇宙機力学特論(2)↓↓↓

航空宇宙機力学特論(2)

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

Learn the basic mechanics and mathematics for analytical mechanics.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	動的固体力学 Dynamics of Solids and Structures	Affiliated department, Job title,Name	Graduate School of Engineering Professor,BIWA SHIROU Graduate School of Engineering Associate Professor,HAYASHI TAKAHIRO

Target year		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]

Fundamental principles for dynamic deformations of solids and structures are examined. In particular, basic characteristics of elastic wave motion in solid media are emphasized. Responses of materials and structures to impact loading are also considered.

[Course Goals]

This course aims to establish the understanding of basic characteristics of dynamic deformations and elastic waves in solid media, as well as to learn about technological applications of ultrasound in a variety of fields. Particular emphasis is put on the mathematical aspects of the physical phenomena involved.

[Course Schedule and Contents]

Week 1: [Fundamentals of elastodynamics] Expressions of stress and strain; Conservation laws; Hooke's law; Principle of virtual work; Hamilton's principle and its applications
Weeks 2-3: [Basics of wave propagation] One-dimensional wave equation; D'Alembert's solution; Harmonic waves; Spectral analysis; Waves in structural members; Dispersive waves; Phase and group velocities
Week 4: [Stress waves in a bar] Reflection and transmission at bi-material connection; Reflection at a free end; Stress wave by tensile loading at a bar end; Plastic wave
Week 5: [Waves in isotropic elastic media] Navier's equations; Longitudinal and transverse waves; Plane elastic waves in isotropic solids
Week 6: [Waves in anisotropic elastic media] Voigt representation; Plane elastic waves in anisotropic solids; Christoffel's equation; Propagation and polarization directions; Slowness surfaces
Weeks 7-8: [Reflection and transmission] Reflection and transmission of normal incident waves; Snell's law; Mode conversion; Reflection and refraction of oblique incident waves
Weeks 9-11: [Guided elastic waves] Bulk waves and guided waves; Rayleigh wave; Love wave; Lamb wave
Weeks 12-13: [Numerical analysis of elastic waves] Finite difference method; Finite element method; Boundary element method
Weeks 14-15: [Measurements of vibration and waves] Comparison of various measurement techniques; Analogue and digital data analysis

[Class requirement]

Basic knowledge of mechanics of materials (solid mechanics, continuum mechanics) is expected.

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

Grading is based on the attendance, homework reports and the final examination.

[Textbook]

No textbooks are assigned. Print-outs are handed in when needed.

Continue to 動的固体力学(2)↓↓↓

動的固体力学(2)

[Reference books, etc.]

（Reference books）

No reference books are assigned.

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

Enrolling students are expected to work on the lecture materials and the homework problems.

（Others (office hour, etc.)）

The time units and weights for each item on the above list are subject to possible changes.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	複雑系機械システムのデザイン Design of Complex Mechanical Systems	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SAWARAGI TETSUO Graduate School of Engineering Professor,TOMITA NAOHIDE Institute for Frontier Life and Medical Sciences Professor,ADACHI TAIJI Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Associate Professor,TSUCHIYA TOSHIYUKI Graduate School of Engineering Professor,KOMORI MASAHARU

Target year		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]

[Course Goals]

[Course Schedule and Contents]

,2times,
,2times,
,2times,
,2times,
,2times,
,2times,

[Class requirement]

None

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

[Textbook]

[Reference books, etc.]

（Reference books）

Continue to 複雑系機械システムのデザイン(2)↓↓↓

複雑系機械システムのデザイン(2)

[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>	気象学Ⅰ Meteorology I	Affiliated department, Job title,Name	Graduate School of Science Professor,YODEN SHIGEO

Target year		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]

, 2～4 times,
, 2～4 times,
, 2～4 times,
, 2～4 times,
, 2～4 times,

[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>	気象学II Meteorology II	Affiliated department, Job title,Name	Graduate School of Science Associate Professor,ISHIOKA KEIICHI

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]

, 3～4 times,
, 3～4 times,
, 3～4 times,
, 3～4 times,

[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>	航空宇宙工学特別実験及び演習第一 Experiments and Exercises in Aeronautics and Astronautics I	Affiliated department, Job title,Name	Graduate School of Engineering Professor,ERIGUCHI KOUJI

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]

,5times,
,5times,
,5times,

[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>	航空宇宙工学特別実験及び演習第二 Experiments and Exercises in Aeronautics and Astronautics II	Affiliated department, Job title,Name	Graduate School of Engineering Professor,ERIGUCHI KOUJI

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]

,5times,
,5times,
,5times,

[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-INF04 63431 LJ55		
Course title <English>	力学系理論特論 Dynamical Systems, Advanced	Affiliated department, Job title,Name	Graduate School of Informatics Professor,YAGASAKI KAZUYUKI

Target year	Master's students	Number of credits	2	Course offered year/period	2019/First semester
Day/period	Tue.2	Class style	Lecture	Language	Japanese
Class type	専攻専門科目				

[Outline and Purpose of the Course]

力学系の知識は数理科学や応用数学の分野において極めて重要なものとなっている．本講義では，分岐およびカオスなどの非線形現象を理解し，解析するための道具である力学系理論を概説し，数値分岐解析ソフトウエアを利用してこれらの現象と応用について理解を深める．

The knowledge of dynamical systems is extremely important in mathematical sciences and applied mathematics. This course provides an outline of dynamical systems theory, which is a tool to understand and analyze nonlinear phenomena such as bifurcations and chaos, and enables you to gain better understandings of these phenomena and applications by using a numerical bifurcation analysis software.

[Course Goals]

力学系の基礎理論を理解し，数値分岐解析ソフトを用いるなどして具体的な問題に応用できるようになること．

To understand fundamental theories of dynamical systems and acquire the ability to apply them to concrete problems.

[Course Schedule and Contents]

1. **力学系理論の概要**
- **分岐** (1)
- **カオス** (1)

2. **数値分岐解析ソフト**AUTO**を用いた演習**
- AUTO**の概要とインストール** (1)
- **境界値問題** (1)
- **平衡点と不動点の分岐** (2)
- **周期軌道の分岐** (2)
- AUTO**で用いられている数値解析手法**(2)
- **ホモクリニック軌道** (2)
- **不変多様体** (3)

1. Outline of dynamical systems theory
- Bifurcations (1)
- Chaos (1)

2. Practices of numerical bifurcation analysis by the software AUTO
- Overview of AUTO and its installation (1)

Continue to 力学系理論特論(2)↓↓↓

力学系理論特論(2)

- Boundary value problems (1)
- Bifurcations of equilibria and fixed points (2)
- Bifurcations of periodic orbits (2)
- Numerical analysis methods used in AUTO (2)
- Homoclinic orbits (2)
- Invariant manifolds (3)

[Class requirement]

微積分，線形代数，微分方程式とコンピュータープログラミングの初歩

Calculus, Linear Algebra, Differential Equations and Elementary Computer Programming

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

達成目標についての達成度をレポートを含む平常点により評価し，情報学研究科成績評価規定第7条による成績評価を行う

[Textbook]

プリントを配布

[Reference books, etc.]

（Reference books）

J. Guckenheimer，P. Holmes 『Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields』（Springer）ISBN:978-0-387-90819-9
J.M. Meiss 『Differential Dynamical Systems』（SIAM）ISBN:978-0-89871-635-1
S. Wiggins 『Introduction to Applied Nonlinear Dynamical Systems and Chaos 』（Springer）ISBN:978-0-387-00177-7
K.T.**アリグッド**/T.D.**サウアー**/J.A.**ヨーク** **『カオス第1巻』（丸善出版）**ISBN:978-4-621-06542-6
K.T.**アリグッド**/T.D.**サウアー**/J.A.**ヨーク** **『カオス第2巻』（丸善出版）**ISBN:978-4-621-06543-3
K.T.**アリグッド**/T.D.**サウアー**/J.A.**ヨーク** **『カオス第3巻』（丸善出版）**ISBN:978-4-621-06540-2
M.W.Hirsch, S. Smale, R.L.Devaney **『力学系入門―微分方程式からカオスまで― 原著第3版』（共立出版）**ISBN:978-4-320-11136-3

（Related URLs）

http://indy.cs.concordia.ca/auto/(**数値分岐解析ソフトウェア**AUTO)

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

本科目の達成目標に到達するには，講義での学習のほかに予習・復習が必要である

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

Numbering code	G-INF04 63410 LJ10　G-INF04 63410 LJ54　G-INF04 63410 LJ55		
Course title <English>	数理解析特論 Mathematical Analysis, Advanced	Affiliated department, Job title,Name	Graduate School of Informatics Associate Professor,TSUJIMOTO SATOSHI

Target year	Master's students	Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Wed.3	Class style	Lecture	Language	Japanese
Class type	専攻専門科目				

[Outline and Purpose of the Course]

急速に発展しつつある非線形モデルの数理的解析手法について、厳密に解けるモデルである可積分系を中心として、アルゴリズム開発への応用など様々な角度から講述する。数式処理ソフトウェアの利用法についても紹介する。

The aim of this course is to provide students with knowledge of advanced mathematical analysis methods for used with the nonlinear models to students. In this lecture course, the integrable systems are introduced as exactly solvable nonlinear models and discussed from various points of view. It is also shown how a typical numerical algorithm is constructed from an integrable system. We also give an elementary introduction to the computer algebra system.

[Course Goals]

可積分系および特殊関数を中心とした非線形モデルの数理的解析手法に関する基本事項について習熟し，アルゴリズム開発などの情報科学の諸課題に取り組むことができるようになる。

[Course Schedule and Contents]

1. **特殊関数および可積分系の紹介**
2. **直交多項式入門**
3. Sturm-Liouville**作用素の固有値問題**
4. **直交多項式のスペクトル変換理論**
5. **離散戸田格子方程式と直交多項式**
6. **離散可積分系と数値計算アルゴリズム**
7. **離散** Lotka-Volterra **方程式と特異値計算アルゴリズム**
8. **半無限格子上あるいは有限格子上の厳密解**
9. KdV **方程式と**Lax pair
10. **ダルブー変換**
11. **有理変換と双線形方程式**
12. **行列式の恒等式**
13. KdV **方程式の離散化**
14. KdV**方程式の超離散化**
15. **箱玉系（ソリトンオートマトン）**

1. Introduction of exactly solvable nonlinear models (integrable system)
2. Theory of orthogonal polynomials
3. Sturm-Liouville eigenvalue problems
4. Spectral transformations of orthogonal polynomials

Continue to 数理解析特論(2)↓↓↓

数理解析特論(2)

5. Toda lattice equation and orthogonal polynomials
6. Discrete integrable systems and numerical algorithms
7. Discrete Lotka-Volterra equation and SVD algorithms
8. Solutions on the semi-infinite lattice or the finite lattice.
9. KdV equation and Lax pair
10. Darboux transformation
11. Rational transformations and the bilinear equations
12. Determinantal identity
13. Discrete analogue of the KdV equation
14. Ultradiscrete analogue of the KdV equation
15. Box and ball systems (soliton cellular automata)

[Class requirement]

None

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

達成目標に対する達成度を、情報学研究科成績評価規程第7条に則り行う。詳細は授業時に説明する。

[Textbook]

Not used

[Reference books, etc.]

（Reference books）
中村佳正他 Y. Nakamura et. al. **『「可積分系の数理」**Mathematics of Integrable Systems**』（朝倉書店**(2018) Asakura-Shoten 2018）ISBN:978-4-254-11727-1
中村佳正　編Y. Nakamura (ed.) **『「可積分系の応用数理」“**Applied Integrable Systems**”』（裳華房**(2000)Shokabo2000 (in Japanese)）

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

本科目の達成目標に到達するには、講義での学習のほかに予習・復習が必要である。

（Others (office hour, etc.)）

講義web**ページ** http://www-is.amp.i.kyoto-u.ac.jp/lab/tujimoto/maadv/
メールでの質問の宛先　tujimoto@i.kyoto-u.ac.jp

The course web page is located at http://www-is.amp.i.kyoto-u.ac.jp/lab/tujimoto/maadv/
If you have any questions on this course, please email to tujimoto@i.kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

Numbering code	G-INF03 63320 LJ57		
Course title <English>	非線形力学特論A Topics in Nonlinear Dynamics A	Affiliated department, Job title,Name	Graduate School of Informatics Assistant Professor,TSUTSU HIROKI

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

Day/period	Wed.4	Class style	Lecture	Language	Japanese

Class type	専攻専門科目

[Outline and Purpose of the Course]

確率微分方程式や関連するマスター方程式、及び、その基本的な応用例としての初通過問題について講述し、フォッカープランク方程式の近似解法、経路積分表示とその応用、確率共鳴現象、及び、分子モーターなどの生命現象に関連した確率モデルなどからいくつかの研究例を紹介する．講義の目的は、主に物理現象において見出される確率的に時間発展する現象（とりわけ状態が連続であるものの変化）を確率微分方程式でモデル化し、対応するマスター方程式を解くという一連の流れを習得することである．

[Course Goals]

確率微分方程式とフォッカープランク方程式の取り扱いに習熟する．

[Course Schedule and Contents]

前半　本講義で必要となる確率過程に関する基礎概念や定義を導入する．

事象と確率、確率変数、期待値、条件付き確率、特性関数、確率変数の和の統計、分布の再生性 （１－２回）
マルコフ過程、チャップマン=コルモゴロフ方程式 （１回）

中盤　確率微分方程式（ランジュバン方程式）とそれから導出されるマスター（フォッカープランク）方程式について説明する．

ウィーナー過程 （１回）
ランジュバン方程式 （１回）
確率微分方程式 （２回）
幾何ブラウン運動 （１回）
フォッカープランク方程式 （１回）

後半　初通過問題やフォッカープランク方程式の近似解法、経路積分表示とその応用、確率共鳴現象、及び、分子モーターなどの生命現象に関連した確率モデルなどからいくつかの研究例を紹介する．

初通過問題 （１ー２回）
準安定状態の崩壊　（１ー２回）
確率共鳴 （１ー２回）
ラチェットモデル （１ー２回）
経路積分表示（Onsager-Machlup 公式）とその応用 （１ー２回）

Continue to 非線形力学特論A(2)↓↓↓

非線形力学特論A(2)

[Class requirement]

None

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

確率微分方程式とフォッカープランク方程式の取り扱いに習熟しているかどうかを評価する．具体的には、毎回配布する講義資料の中の小問への解答をレポートとして提出して頂き、その得点に応じて成績評価を行う．

[Textbook]

資料を授業時に配布する．

[Reference books, etc.]

（Reference books）

Introduced during class

（Related URLs）

http://wwwfs.acs.i.kyoto-u.ac.jp/~tutu/pukiwiki/index.php?%B9%D6%B5%C1%BB%F1%CE%C1(**に当講義のページへのリンクを置く予定である．**)

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

配布資料とその中で提供される問題等を参考にして予習と復習をすること．

（Others (office hour, etc.)）

講義内容への質問等は、授業終了後かメール(tutu@acs.i.kyoto-u.ac.jp)**にて受け付ける．**

*Please visit KULASIS to find out about office hours.