| 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 |
| 10G203 | マイクロプロセス・材料工学 | Microprocess and Micromaterial Engineering |
| 10G205 | マイクロシステム工学 | Microsystem Engineering |
| 10G211 | 物性物理学１ | Solid State Physics 1 |
| 10G223 | ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ基礎セミナーA | Basic Seminar on Micro Engineering A |
| 10G224 | ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ基礎セミナーB | Basic Seminar on Micro Engineering B |
| 10B418 | 先進材料強度論 | Strength of Advanced Materials |
| 10G214 | 精密計測加工学 | Precision Measurement and Machining |
| 10V003 | バイオメカニクス | Biomechanics |
| 10V201 | 微小電気機械システム創製学 | Micro Electro Mechanical System Creation |
| 10G041 | 有限要素法特論 | Advanced Finite Element Method |
| 10W603 | 医工学基礎 | Introduction to Biomedical Engineering |
| 10B617 | 量子分子物理学特論 | Quantum Theory of Molecular Physics |
| 10V205 | 物性物理学２ | Solid State Physics 2 |
| 10i056 | 現代科学技術特論（8回コース） | Advanced Modern Science and Technology(8 times course) |
| 10X411 | 複雑系機械システムのデザイン | Design of Complex Mechanical Systems |
| 10X402 | アーティファクトデザイン論 | Theory for Designing Artifacts |
| 10G061 | 応用数理科学 | Applied mathematical sciences |
| 88G101 | 研究倫理・研究公正（理工系） | Research Ethics and Integrity(Scienceand Technology) |
| 88G104 | 知的財産 | Intellectual Property |
| 10G049 | インターンシップM（機械工学群） | Engineering Internship M |
| 10G226 | ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別実験及び演習第一 | Experiments on Micro Engineering, Adv. I |
| 10G228 | ﾏｲｸﾛｴﾝｼﾞﾆｱﾘﾝｸﾞ特別実験及び演習第二 | Experiments on Micro Engineering, Adv. II |
| 10G058 | 複雑系機械工学基礎セミナー１ | Basic Seminar of Complex Mechanical Engineering,1 |
| 10G059 | 複雑系機械工学基礎セミナー２ | Basic Seminar of Complex Mechanical Engineering,2 |

未更新

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 応用数値計算法<br>Applied Numerical Methods | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,INOUE YASUHIRO<br>Graduate School of Engineering<br>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<br>Solid Mechanics, Adv. | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,HIRAKATA HIROYUKI<br>Graduate School of Engineering<br>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<br>Thermal Science and Engineering | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,YOSHIDA HIDEO<br>Graduate School of Engineering<br>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<br>Introduction to Advanced Fluid Dynamics | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,INAMURO TAKAJI<br>Graduate School of Engineering<br>Professor,HANAZAKI HIDESHI<br>Graduate School of Engineering<br>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<br>Quantum Condensed Matter Physics | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,HASUO MASAHIRO<br>Graduate School of Engineering<br>Associate Professor,NAKAJIMA KAORU<br>Graduate School of Engineering<br>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<br>Design and Manufacturing Engineering | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,MATSUBARA ATSUSHI<br>Graduate School of Engineering<br>Associate Professor,IZUI KAZUHIRO<br>Graduate School of Engineering<br>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<br>Dynamic Systems Control Theory | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,SAWARAGI TETSUO<br>Graduate School of Engineering<br>Senior Lecturer,NAKANISHI HIROAKI<br>Graduate School of Engineering<br>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<br>Engineering Ethics and Management of Technology | Affiliated department, Job title,Name | Graduate School of Engineering Professor,SAWARAGI TETSUO<br>Graduate School of Engineering Senior Lecturer,NAKANISHI HIROAKI<br>Graduate School of Engineering Professor,TOMITA NAOHIDE<br>Graduate School of Engineering Professor,KOMORI MASAHARU<br>Graduate School of Engineering Professor,MATSUBARA ATSUSHI<br>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.

未更新

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | マイクロプロセス・材料工学<br>Microprocess and Micromaterial Engineering | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,TABATA OSAMU<br>Graduate School of Engineering<br>Associate Professor,TSUCHIYA TOSHIYUKI<br>Graduate School of Engineering<br>Associate Professor,YOKOKAWA RYUUJI<br>Graduate School of Engineering<br>Assistant Professor,URABE KEIICHIRO |

| 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]**

Micro/nano fabrication processes and materials used to realize micro/nano systems are described. Topics will be photolithography, dry-etching, thin-film deposition, which includes bulk micro machining, surface micro machining and further advanced polymer processing.

**[Course Goals]**

To obtain fundamental knowledge about design and fabrication of micro/nano systems and to be familiar with recent fabrication technologies and micro/nano systems.

**[Course Schedule and Contents]**

Semiconductor microfabrication,3times,Describe about the semiconductor microfabrication techniques.
Thin-film process and evaluation,3times,Describe about the thin-film process and evaluation techniques.
Silicon micromachining,3times,Describe about the silicon micromachining techniques.
3D lithography,3times,Describe about the 3D lithography techniques.
Soft-micromachining,2times,Describe about the soft-micromachining techniques.
Feedback,1time,

**[Class requirement]**

None

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

Evaluated by homework. All report must be submitted to obtain credits.

**[Textbook]**

**[Reference books, etc.]**

**（Reference books）**

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

**（Others (office hour, etc.)）**

Students unfamiliar with Japanese may enroll in this course. Their lessons will be supplemented with presentation slides, homework, and other additional course materials in English.

*Please visit KULASIS to find out about office hours.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | マイクロシステム工学<br>Microsystem Engineering | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,TABATA OSAMU<br>Graduate School of Engineering<br>Associate Professor,TSUCHIYA TOSHIYUKI<br>Graduate School of Engineering<br>Associate Professor,YOKOKAWA RYUUJI<br>Institute for Frontier Life and Medical Sciences<br>Senior Lecturer,OKEYO, Kennedy Omondi<br>Institute for Advanced Study<br>Associate Professor,KAMEI KENICHIROU |

| Target year | | Number of credits | 2 | Course offered year/period | 2019/Second semester |
|---|---|---|---|---|---|
| Day/period | Fri.5 | Class style | Lecture | Language | English |

## [Outline and Purpose of the Course]

Microsystem covers not only technologies related to individual physical or chemical phenomenon in micro scale, but also complex phenomena which are eveolved from their interaction. In addtion, its fusion with nanotechnology and biotechnology, named Nanobio-technology is being studied.
In this course, the physics and chemistry in micro and nanoscale will be lectured in contrast to those in macro scale. The various kinds of application devices (ex. physical (pressure, flow, force) sensors, chemical sensors, biosensors, actuators (piezoelectric, electrostatic, and shape memory), bio (molecular sensing, protein, manipulation of DNA and cell) and their system are discussed.

## [Course Goals]

Understand the theory of sensing and actuating in microsystem. Acquire basic knowledge to handle various kinds of phenomena in microscale.
In addition, understand principles in nanotechnology and bioscience, and aquire knowledge of technologies for realizing microsystem and nanobio devices.

## [Course Schedule and Contents]

*MEMS modeling and simulation, 3times
Multi-physics modeling in microscale. Electro-mechanical coupling analysis. System level simulation in MEMS.
* Microsystem,4times
Electrostatic, piezoresistive, thermal, piezoelectric, electromagnetic sensors and actuators. Theory and application devices, such as physical sensors, chemical sensors and optical devices.
* Micro total analysys system, 4times
Chemical analysis system and bio-sensing device using microsytem.
* Nano bio system, 4 times
Application of Bio MEMS and micro-TAS to life science, medical science, and biomedical engineering.

## [Class requirement]

Students are required to take the 10G203 course Micro Process and Material Engineering.

Continue to マイクロシステム工学(2)↓↓↓

**マイクロシステム工学(2)**

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

The evaluation will be based on the reports given in each lecture.

**[Textbook]**

Provided in the lecture.

**[Reference books, etc.]**

**（Reference books）**

Provided in the lecture.

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

Lectures are related to  10V201 Introduction to the Design and Implementation of Micro-Systems.

**（Others (office hour, etc.)）**

The student can register only to this class 10G205, but it is required to be able to take consecutive classes at Friday 4th and 5th. Those students who want to take this course has to contact Prof. Tsuchiya (tutti@me.kyoto-u.ac.jp) by the end of 1st term. The student of this class is strongly recommended to take a course 10V201 Introduction to the Design and Implementation of Micro-Systems(10V201), which is a practice for designing microsystem. Those who want to take 10V201 have to take training course for CAD in advance.

*Please visit KULASIS to find out about office hours.

未更新

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 物性物理学 1<br>Solid State Physics 1 | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,SUZUKI MOTOFUMI<br>Graduate School of Engineering<br>Associate Professor,NAKAJIMA KAORU |

| 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]**

**[Course Goals]**

**[Course Schedule and Contents]**

,1time,
,1-2times,
,1time,
,1time,
, 1 -2times,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1-2times,
,1time,

**[Class requirement]**

None

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

**[Textbook]**

**[Reference books, etc.]**

（Reference books）

Continue to 物性物理学１(2)↓↓↓

**物性物理学１(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> | マイクロエンジニアリング基礎セミナーA<br>Basic Seminar on Micro Engineering A | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,MATSUBARA ATSUSHI |

| Target year | | Number of credits | 2 | Course offered year/period | 2019/Intensive, First semester |
|---|---|---|---|---|---|
| Day/period | Intensive | Class style | Seminar | Language | Japanese |

**[Outline and Purpose of the Course]**

**[Course Goals]**

**[Course Schedule and Contents]**

,10times,
,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> | マイクロエンジニアリング基礎セミナーB<br>Basic Seminar on Micro Engineering B | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,MATSUBARA ATSUSHI |

| Target year | | Number of credits | 2 | Course offered year/period | 2019/Intensive, Second semester |
|---|---|---|---|---|---|
| Day/period | Intensive | Class style | Seminar | Language | Japanese |

**[Outline and Purpose of the Course]**

**[Course Goals]**

**[Course Schedule and Contents]**

,10times,
,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> | 先進材料強度論<br>Strength of Advanced Materials | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,HOUJIYOU MASAKI<br>Graduate School of Engineering<br>Associate Professor,NISHIKAWA MASAAKI |

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

## [Outline and Purpose of the Course]

The mechanism underlying mechanical and functional properties are lectured for advanced materials used and developed in advanced fields of current engineering. In particular, advanced composite materials, used for aircraft structure etc., are introduced, with a detailed description of the relationship between microscopic constituent materials and macroscopic properties from the perspective of multiscale mechanics; also the anisotropy of their properties, their fatigue and fracture properties are described in the basic discipline for strength of materials. The latest applications are introduced in the field of various transportation systems including airplanes.

## [Course Goals]

The course goal is to understand basic concepts of composite materials and the underlying mechanism of their mechanical properties from multiscale viewpoints, while the phsyical understanding of composites is developed based on multiple disciplines.

## [Course Schedule and Contents]

Concept of composite materials,2times,The concept and definition of composite materials, their constituent materials and manufacturing methods are illustrated. Their application to aircraft structures etc. are also introduced.
Mechanical properties of microscopic constituent materials,2times,Resin for matrix and various fiber types are explained including their structure and mechanical properties. The weakest link model and Weibull distribution are described as a basis of the statistic nature of strength.
Basic mechanical properties,4times,The specific strength, the specific stiffness, and the rule of mixture for elastic modulus and strength are lectured. In particular, the detailed explanation is made to the anisotropy of elastic modulus, independent elastic constants in the generalized Hookean law, the anisotropic failure criteria, and laminate theory. The relationship between the mechanical properties of microscopic constituent materials and macroscopic properties of composite materials is also illustrated.
Micromechanics,2times,The mechanism of transverse fracture is illustrated. The mechanical models are described for short fiber reinforced composites and particle dispersed composites. The micromechanical analyses based on finite element method is also illustrated for the physical understanding of the strength of composite materials.
Fracture mechanics properties,2times,Fracture mechanics of anisotropic materials are described. The interlaminar fracture toughness and interlaminar fatigue crack propagation, the critical issues in the application of composite structures, are explained including their underlying mechanism.
Superconducting materials,1time,High-temperature superconducting materials are the composite materials consisting of metals and fibrous superconducting materials made of oxides. The mechanism are explained for understanding that their mechanical properties so much control their electric properties.
Process and mechanical properties of composite materials,1time,The molding and machining process of composite materials is explained to relate it to their mechanical properties. Fiber preform, the selection of resin, intermediate materials, machining and assembly and inspection methods are overviewed from the

Continue to 先進材料強度論(2)↓↓↓

**先進材料強度論(2)**

academic viewpoints.
Academic achievement test,1time,Academic achievements is assessed.

**[Class requirement]**

Mechanics of Materials, Continuum Mechanics, Fundamentals of Materials, Solid Mechanics, Adv.

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

Grading is based on the reports. The assignments will be given around three times.

**[Textbook]**

Supplementary handouts will be distributed in the class.

**[Reference books, etc.]**

**（Reference books）**

D.Hull and T.W.Clyne, An Introduction to Composite Materials, Cambridge University Press.

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

**（Others (office hour, etc.)）**

The order and the item in the course are possibly subject to change.

*Please visit KULASIS to find out about office hours.

未更新

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 精密計測加工学<br>Precision Measurement and Machining | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,MATSUBARA ATSUSHI<br>Graduate School of Engineering<br>Senior Lecturer,BEAUCAMP, Anthony Tadeus Herve |

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

**[Outline and Purpose of the Course]**

This course gives the principles of precision measurement and machining process for the meso-micro-nano metric fabrication. The optical measurement technologies (e.g. laser interferometer, optical encoders) and cutting technologies (e.g. cutting mechanics, tool, machine) are shown.

**[Course Goals]**

Understand the basic principles of precision mesurement and machining associated with the applications

**[Course Schedule and Contents]**

Basics of measurement and machining,1time,Concept of accuracy, precision, Relation of measurement, machining, and control
Basics of precision measurement,2times,
Optical mesurement,4times,
,3times,
,1time,
,2times,
,2times,

**[Class requirement]**

None

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

Small exams in the term and the final exam

**[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> | バイオメカニクス<br>Biomechanics | Affiliated department, Job title,Name | Institute for Frontier Life and Medical Sciences<br>Professor,ADACHI TAIJI |

| 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]**

**[Course Goals]**

**[Course Schedule and Contents]**

Introduction,1time,
,2times,
,4times,
,4times,
,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> | 微小電気機械システム創製学<br>Micro Electro Mechanical System Creation | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,TABATA OSAMU<br>Graduate School of Engineering<br>Associate Professor,TSUCHIYA TOSHIYUKI<br>Graduate School of Engineering<br>Associate Professor,YOKOKAWA RYUUJI |

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

| Day/period | Fri.4 | Class style | Lecture | Language | English |
|---|---|---|---|---|---|

## [Outline and Purpose of the Course]

This is a joint lecture with Hong Kong University of Science and Technology (HKUST). A team consists of two students from each University work together to fullfill the assignment (design a microsystem) through paper survey, analysis,design, and presentation. A student can acquire not only the basic knowledge of a microsystem, but also comprehensive ability of English such as technical knowledge in English, skill for team work, and communication.

## [Course Goals]

Acquire the knowledge and skill to design and analyze a microsystem.

## [Course Schedule and Contents]

* Tutorial on microsystem CAD software, 2times
Master CAD program for microsystem design and analysis which will be utilized to accomplish an assignment.
* Lecture and Task Introduction,2times
Learn basic knowledge necessary to design a microsystem/MEMS(Micro Electromechaical Systems) utilizing microfabrication technology.
* Design and analysis work, 4times
Analyze and design a microsystem by communicating with a team member
of HKUST.
* Presentation I, 2times
The designed device and its analyzed results is presented in detail by team in English.
* Evatuation of device, 3times
Evaluate the fabricated microsystem.
* Presentation II, 2times
The measured results and comparison between the analyzed results of the fabricated microsystem is presented by team in English.

## [Class requirement]

Students are required to take the 10G203 course Micro Process and Material Engineering provided in 1st term.

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

【Evaluation method】
Evaluation will be based on presentatins (60 points) and the end of the term assignments (40 points).
【Evaluation standard】
Presentations are evaluated with not only design, simulation and measurement results of device, but also

Continue to 微小電気機械システム創製学(2)↓↓↓

collaboration among their team members.

**[Textbook]**

Instructed during class

**[Reference books, etc.]**

**（Reference books）**

Introduced during class

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

The class is a problem-solving class. Learning and work outside the lecture hours are indispensable.

**（Others (office hour, etc.)）**

The student of this class is required to register to the course 10G205 Microsystem Engineering provided at Friday 4th so as to be able to take consecutive classes at Friday 4th and 5th. Those who want to take this course have to take training course for CAD in advance. Those students who want to take this course has to contact Prof. Tsuchiya (tutti@me.kyoto-u.ac.jp) by the end of 1st term.

*Please visit KULASIS to find out about office hours.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 有限要素法特論<br>Advanced Finite Element Method | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,NISHIWAKI SHINJI |

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

| Day/period | Wed.2 | Class style | Lecture | Language | English |
|---|---|---|---|---|---|

**[Outline and Purpose of the Course]**

This course presents the basic concept and mathematical theory of the Finite Element Method (FEM), and explains how the FEM is applied in engineering problems. We also address important topics such as the physical meaning of geometrical non-linearity, material non-linearity, and non-linearity of boundary conditions, and we explore numerical methods to deal with these nonlinearities. Also, we guide students in class in the use of software to solve several numerical problems, to develop practical skill in applying the FEM to engineering problems.

**[Course Goals]**

The course goals are for students to understand the mathematical theory of the FEM and the numerical methods for analyzing non-linear problems based on the FEM.

**[Course Schedule and Contents]**

Basic knowledge of the FEM,3times,What is the FEM? The history of the FEM, classifications of partial differential equations, linear problems and non-linear problems, mathematical descriptions of structural problems (stress and strain, strong form and weak form, the principle of energy).
Mathematical background of the FEM,2times,Variational calculus and the norm space, the convergence of the solutions.
FEM formulations,3times,FEM approximations for linear problems, formulations of iso-parametric elements, numerical instability problems such as shear locking, formulations of reduced integration elements, non-conforming elements, the mixed approach, and assumed-stress elements.
Classifications of nonlinearities and their formulations,4times,Classifications of nonlinearities and numerical methods to deal with these nonlinearities.
Numerical practice,2times,Numerical practice using COMSOL.
Evaluation of student achievements,1time,

**[Class requirement]**

Solid Mechanics

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

Grading is based the quality of two or three reports and the final exam.

**Continue to 有限要素法特論(2)↓↓↓**

**有限要素法特論(2)**

**[Textbook]**

Not used

**[Reference books, etc.]**

**（Reference books）**

Bath, K.-J., Finite Element Procedures, Prentice Hall \Belytschko, T., Liu, W. K., and Moran, B.., Nonlinear Finite Elements for Continua and Structures, Wiley

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

N/A

**（Others (office hour, etc.)）**

*Please visit KULASIS to find out about office hours.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 医工学基礎<br>Introduction to Biomedical Engineering | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,TOMITA NAOHIDE |

| Target year | | 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]**

Understand　basic concepts related to clinical medicine and medical engineering**.**　And expand the range of research by exchange each engineering knowledge and experience.

**[Course Goals]**

Expand the range of research through exchanges with other fields.

**[Course Schedule and Contents]**

Introduction to medicine for engineering students, **1** times,
Introduction to Medical Engineeri, **1** times,
Cross-field workshop, **1　3** times,

**[Class requirement]**

None

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

Participate to the workshops submit a report

**[Textbook]**

Not fixed

**[Reference books, etc.]**

**（Reference books）**
Introduced during class

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

Summarize each own research content.

**（Others (office hour, etc.)）**

*Please visit KULASIS to find out about office hours.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 量子分子物理学特論<br>Quantum Theory of Molecular Physics | Affiliated department, Job title,Name | Graduate School of Engineering<br>Senior Lecturer,SENAMI MASATO |

| 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]**

Basics for the application of quantum theory to molecular physics and recent progress. Main topics: analytic mechanics, relativistic quantum mechanics, quantum field theory, and path integral.

**[Course Goals]**

To understand fundamental physics to apply quantum mechanics to phenomena of atoms or molecules.

**[Course Schedule and Contents]**

1. Analytic mechanics and symmetry in physics,2times,Principle of least action, Equation of motion, Hamiltonian mechanics, Symmetry and conservation law in physics, Noether#039s theorem, Group theory
2. Classical relativistic theory,2times,Invariance of the speed of light, Lorentz transformation, Relativistic form of electromagnetism, Four component vector potential
3. Relativistic quantum mechanics,4-6times,Relativistic equation of motion, Nonrelativistic limit of Dirac equation, Covariance of Dirac equation, Plane wave solution for Dirac equation and negative energy, Hole theory and problem, Tani-Foldy-Wouthuysen transformation, Chrality
4. A primer of quantum field theory,2-4times,Field operator, Charge conjugation, Noether#039s theorem, Gauge transformation and gauge symmetry, Application of quantum field theory to theoretical study of molecules and condensed matter
5. Electronic Structure Computation,2times,Time evolution and propagator, Transition amplitude and path integral, Aharonov-Bohm effect, Path integral in quantum field theory

Confirmation ,1time,

**[Class requirement]**

Quantum Mechanics

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

Evaluation will be based on assignments (six times, 100 points).

**[Textbook]**

Not used

**[Reference books, etc.]**

**（Reference books）**

J. D. Bjorken, S. D. Drell, Relativistic Quantum Mechanics\ J. J. Sakurai, Modern Quantum Mechanics, and Advanced Quantum Mechanics\ R. P. Feynmann, A. R. Hibbs, Quantum Mechanics and Path Integrals

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

Review lecture notes.

**（Others (office hour, etc.)）**

If English support is required, please contact the instructor by email. Then words written on a blackboard and some supplementary documents are provided in English.

*Please visit KULASIS to find out about office hours.

未更新

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 物性物理学２<br>Solid State Physics 2 | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,SUZUKI MOTOFUMI<br>Graduate School of Engineering<br>Associate Professor,NAKAJIMA KAORU |

| 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]**

,4-5times,
,4-5times,
,4-5times,
,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.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 現代科学技術特論（8回コース）<br>Advanced Modern Science and Technology (8 times course) | Affiliated department, Job title,Name | Graduate School of Engineering<br>Senior Lecturer,ASHIDA RIYUUICHI<br>Graduate School of Engineering<br>Senior Lecturer,MATSUMOTO RIYOUSUKE<br>Graduate School of Engineering<br>Senior Lecturer,MAEDA MASAHIRO<br>Graduate School of Engineering<br>Senior Lecturer,YOROZU KAZUAKI<br>Graduate School of Engineering<br>Senior Lecturer,KANEKO KENTAROU |

| Target year | | Number of credits | 1 | Course offered year/period | 2019/Second semester |
|---|---|---|---|---|---|
| Day/period | Thu.5 | Class style | Lecture | Language | English |

## [Outline and Purpose of the Course]

Engineering/Engineers have been expected to fulfill key roles among social issues and others, such as energy, environment and resource. This class introduces cutting edge science and technologies from their backgrounds, research and development, to problems for the practical applications. Group discussions will be done for further understanding of the topics of the course.

## [Course Goals]

The students understand of each technology towards social issues to be solved by engineers. In addition, the students learn the importance for engineers to have multidisciplinary mind and understand the significance of engineering to realize sustainable development.

## [Course Schedule and Contents]

Topic I Computer-Aided Analyses for Fluid
Week 1-2, Lagrangian Meshfree Methods as New Generation Computational Tools
Week 3, CFD in Process Systems Engineering
Week 4, CFD in Hydraulic Engineering
Topic II Utilization of Light Energy
Week 5-6, Photochemistry of Organic Molecules
Week 7, Solar Energy Conversion Using Semiconductor Photocatalysts
Week 8, Efficiency Improvement in Solar Cells by Photonic Nano Structures
Topic III Materials Analysis
Week 9-10,Crystal Structure Analysis by Power X-ray Diffraction Measurement
Week 11-12, Principles and Applications of Fluorescence Spectroscopy

## [Class requirement]

Each topic consists of four lectures.
This course requests to choose two topics from provided three topics in advance.
It is prohibited to change the topics after registration.

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

The average score of the best two assignments for each topic is employed.
For each topic which the students chose, they must attend minimum three lectures and submit minimum two assignments evaluated as "passed".

Continue to 現代科学技術特論（8回コース）(2)↓↓↓

**現代科学技術特論（8回コース）(2)**

**[Textbook]**

Course materials will be provided.

**[Reference books, etc.]**

**（Reference books）**

**（Related URLs）**

http://www.glc.t.kyoto-u.ac.jp/grad(The home page of the engineering education research center)

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

This course requests students to prepare a class in advance becouse some classes will be done by an interactive style as necessary.

**（Others (office hour, etc.)）**

It is prohibited to change the registered course.
It is prohibited to attend the lectures of the other topic than the students chose.
All the students are requested to attend the guidance which will be held on the first class.

*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<br>Design of Complex Mechanical Systems | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,SAWARAGI TETSUO<br>Graduate School of Engineering<br>Professor,TOMITA NAOHIDE<br>Institute for Frontier Life and Medical Sciences<br>Professor,ADACHI TAIJI<br>Graduate School of Engineering<br>Professor,NISHIWAKI SHINJI<br>Graduate School of Engineering<br>Associate Professor,TSUCHIYA TOSHIYUKI<br>Graduate School of Engineering<br>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> | アーティファクトデザイン論<br>Theory for Designing Artifacts | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,SAWARAGI TETSUO |

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

| Day/period | Wed.5 | Class style | Lecture | Language | English |
|---|---|---|---|---|---|

## [Outline and Purpose of the Course]

The activity of design is fundamentally similar across a wide variety of domains. I use artifact in a broad and atypical sense to describe any product of intentional creation, including physical goods, services, information systems, buildings, landscapes, organizations, and societies. The central theme of this lecture is that a unifying framework informs the human activity of design across all domains. Especially, understanding user needs is a key element of problem definition, and that understanding is usually best developed with interactive and immersive methods. In this lecture, a variety of methodologies for participatory systems approach and an idea of user-experience are provided, and its contributions to the design process are discussed.

## [Course Goals]

This course is aimed at developing the ability to apply methods for identifying problems and interactively analyzing/evaluating systems, based on understanding of the principles of artifact design and on systematic thinking.

## [Course Schedule and Contents]

Introduction,1time,We will shed light on the concept of artifacts as something to be put on equal footing with natural objects and examine the history of artifacts in terms of how they were viewed in different ages? namely, artifacts as modes of representation in the ancient world, artifacts as necessities for survival in the middle ages, artifacts as forms of convenience in modern times, and artifacts as a means of perpetuation in the current era.
Artifact function and purpose,3times,The effects that artifacts have on the outside world?i.e., other things?are ldquofunctions.rdquo Function is the concept of questioning the existence of an artifact, and design is the formulation of functions for achieving an intended purpose. We will discuss the categorization of artifacts in terms of how the ldquopurposerdquo of artifacts relates to the context in which they are used, and look at the origins of artifacts from the perspective of semiosis.
Artifact design principles,2times,To understand an artifact is to know how its internal structure acts on the outside world to realize its function. Today, cybernetics?which has explored the interaction between the physical world and the world of information?is expanding into a concept that encompasses society as well (second-order cybernetics), and concepts have been put forward for actively rethinking how human cognition and decision-making interact with the outside world (ecological approaches, socially distributed cognition, naturalistic decision-making). We will examine artifact design principles based on theories related human activity at the boundary of these externalities.
Artifact design representation and evaluation,3times,Design must fulfill its role of enhancing the quality of life through the creation of not only individual artifacts, but also environments and social systems that encompass groups of artifacts and natural objects. We will discuss the path toward expanding the scope of design from physical objects to environments and social systems that include intangible services, including with regard to problem development/representation methods, how to set purposes of design, how to eliminate the ambiguities and conflicts among various goals, searching for alternative design strategies, design

Continue to アーティファクトデザイン論(2)↓↓↓

evaluation, and principles and methods of consensus-forming among different stakeholders.
User-centered artifact design,2times,The quality of designs is something to be evaluated by the user, and hence there must be collaboration between users and designers/producers. Moreover, complex design challenges cannot be resolved by experts of only one discipline; they must be tackled by pooling the design-related knowledge of different domains. We will discuss the concept of user-centered design, design rationale, and international standards of design processes for achieving design that is grounded in the userrsquos needs/ perspective.
Participatory systems approach,2times,In order to deal with the design of large-scale, complex artifacts, one must take the approach of systemically structuring problems and basing design on diverse perspectives. We will broadly examine: interactive processes among system designers, users, and computers; methods of structurally modeling problems through repeated dialogue between experts in relative disciplines and computers; and ways of supporting the perceptions, interpretations, and decision-making of designers and users. We will also consider the utility of the participatory systems approach in smooth, effective implementation of system design.
Exercise in participatory systems approach,2times,Students will apply the participatory systems approach to a real-world artifact design challenge, and report the results of this exercise.

**[Class requirement]**

None

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

Students will be evaluated based on the following criteria, in the order listed. (1) Exercises assigned in class: approx. 20% (2) Final exam: approx. 60% (3) Contributions to classwork (e.g., asking good questions): approx. 20%

**[Textbook]**

Lecture notes used in class will be distributed as needed. Refer to ldquoTextbook (supplemental)rdquo below.

**[Reference books, etc.]**

**（Reference books）**

1. **吉川弘之** [2007] **人工物観**, **横幹**, 1(2), 59-65 2. Suh, N.P. [1990] The Principles of Design, Oxford University Press （**邦訳：スー(翻訳：畑村洋太郎)「設計の原理? 創造的機械設計論」**, **朝倉書店**, 1992.） 3. **吉川弘之** [1979] **一般設計学序説**, **精密機械**45 (8) 20?26, 1979. 4. Vladimir Hubka and W. Ernst Eder [1995] Design Science, Springer 5. Simon,H.[1996] The Sciences of the Artificial Third edition **秋葉元吉、吉原英樹訳**[1999]**『システムの科学』パーソナルメディア** 6. H・A・**サイモン**[1979] **稲葉元吉・倉井武夫訳**, **『意思決定の科学』**,**産業能率大学出版部** 7. Hutchins, Edwin [1995] Cognition in the Wild. MIT Press 8. Klein, G., Orasanu, J., Calderwood, R., and Zsambok, C.E. [1993] Decision Making in Action: Models and Methods. Ablex Publishing Co., Norwood, NJ. 9. D・**ノーマン**[1986] The Design of Everyday Things, **野島久雄訳『誰のためのデザイン?：認知科学者のデザイン原論』、新曜社** 10. **椹木、河村**[1981]**：参加型システムズ・アプローチ―手法と応用、日刊工業新聞社ほか**

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

Continue to アーティファクトデザイン論(3)↓↓↓

アーティファクトデザイン論(3)

## （Others (office hour, etc.)）

Office hours will be held for one hour before and after each class period (preferably 5th period on Tuesdays, but also 3rd period on Wednesdays). Appointments for other times can be requested by e-mail.

*Please visit KULASIS to find out about office hours.

| Numbering code | G-ENG05 5G061 LJ71　G-ENG06 5G061 LJ71 | | |
|---|---|---|---|
| Course title <English> | 応用数理科学<br>Applied mathematical sciences | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,INOUE YASUHIRO |

| Target year | | 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]**

数理科学は、様々な分野における数理的な課題解決に応用されている。特に、支配法則が明確でない複雑性の高い現象や不確実性を伴う現象を理解し予測する上では、数学的アイデアにもとづく数理モデルの構築が重要となる。本講義では、このような応用的な観点から、数理科学の実践について学ぶ。

**[Course Goals]**

数理的な課題解決に必要となる共通の考え方について学び、微分方程式および確率・統計を用いた数理モデル構築の技術に習熟する。

**[Course Schedule and Contents]**

○概論（1）　数理モデルの構築に必要となる考え方を学ぶ。

○微分方程式による数理モデル（5）線形微分方程式および非線形微分方程式の観点から、数理モデルを紹介し、少数の共通した数理モデルにより、広範な分野における非常に多様な現象を表現することができることを学ぶ。

○確率・統計による数理モデル（4）不確実性を伴う現象を理解する上で重要となる確率・統計の考え方を紹介し、確率微分方程式による数理モデルの構築や種々のデータに基づく統計モデルの構築の基礎を学ぶ。

○グループワーク（4）支配法則が明確でない諸現象に対して、数理モデルによる課題解決の実践をグループワークにより行う。数理的な課題解決プロセスを体験することにより、数理モデルの構築に必要となる考え方の取得を目指す。

○学修到着度の確認(1) 学修到達度の確認を行う。

**[Class requirement]**

微積分、確率・統計に関する基本的な知識

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

講義中に行うグループワークおよびレポート試験による。

Continue to 応用数理科学(2)↓↓↓

**応用数理科学(2)**

**[Textbook]**

Not used

**[Reference books, etc.]**

**（Reference books）**

Introduced during class

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

**講義資料による復習を充分行うこと。**

**（Others (office hour, etc.)）**

*Please visit KULASIS to find out about office hours.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | インターンシップM（機械工学群）<br>Engineering Internship M | Affiliated department, Job title,Name | Graduate School of Engineering Professor,HASUO MASAHIRO<br>Graduate School of Engineering Professor,KUROSE RYOUICHI |

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

| Day/period | Intensive | Class style | Practical training | Language | Japanese |
|---|---|---|---|---|---|

**[Outline and Purpose of the Course]**

The aim of the internship is experiencing on-site activities involved production, manufacturing, development, designing and research of industrial goods at a factory or a research laboratory of Japanese leading companies.

On-site learning of the importance of teamwork and production processes in manufacturing is also the aim.

**[Course Goals]**

The goal of the internship is to master a general method of thinking and methodology at Mechanical Engineering. Furthermore, by learning the relationship between a human and machines at an industry, motivate oneself to study and think about one's career development.

**[Course Schedule and Contents]**

As a general rule, the internship should meet the above purpose. The duration should be not less than two weeks. Thus, the following cases are not approved as an internship; a short internship such as a week, a company tour, a company explanation meeting and so on. Longer term more than two weeks and an overseas internship such as IAESTE can be acceptable.
Internship location: Based on recruitment from companies. You can find them at company's web sites and/or the educational affairs office of the Engineering Science office (Butsuri Kyoumu).

**[Class requirement]**

None

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

Credits (2) are approved based on the summary report (50%) and presentation (50%) about the internship activities.

**[Textbook]**

Not used

**[Reference books, etc.]**

**（Reference books）**

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

Consult with the internship host location.

**（Others (office hour, etc.)）**

Pre-registration at the educational affairs office of the Engineering Science (Butsuri Kyoumu) is required.

*Please visit KULASIS to find out about office hours.

未更新

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | マイクロエンジニアリング特別実験及び演習第一<br>Experiments on Micro Engineering, Adv. I | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,MATSUBARA ATSUSHI |

| 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]**

, **1** times,
,9times,
,10times,
,10times,

**[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> | マイクロエンジニアリング特別実験及び演習第二<br>Experiments on Micro Engineering, Adv. II | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,MATSUBARA ATSUSHI |

| 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]**

,9times,
,10times,
,10times,
,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.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 複雑系機械工学基礎セミナー１<br>Basic Seminar of Complex Mechanical Engineering,1 | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,HIRAKATA HIROYUKI<br>Graduate School of Engineering<br>Senior Lecturer,SUGIMOTO HIROSHI<br>Graduate School of Engineering<br>Senior Lecturer,AOI SHINYA<br>Graduate School of Engineering<br>Professor,KOMORI MASAHARU |

| Target year | | Number of credits | 1 | Course offered year/period | 2019/First semester |
|---|---|---|---|---|---|
| Day/period | Tue.1 | Class style | Seminar | Language | English |

**[Outline and Purpose of the Course]**

This seminar provides master-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multidisciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

**[Course Goals]**

Students will be able to acquire presentation and logical thinking skills.

**[Course Schedule and Contents]**

Self introduction,1-2times,
Organizing groups,1time,
Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation,1-2times,Each group gives presentation of its final resutls.

**[Class requirement]**

None

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

Based on Group Activity Reports and Personal Report

**[Textbook]**

Not used

**[Reference books, etc.]**

**（Reference books）**

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

Group activities

**（Others (office hour, etc.)）**

All activities should be done in English.
Registration is required by the deadline. Contact at
cme-seminar@me.kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

| Numbering code | | | |
|---|---|---|---|
| Course title <English> | 複雑系機械工学基礎セミナー２<br>Basic Seminar of Complex Mechanical Engineering,2 | Affiliated department, Job title,Name | Graduate School of Engineering<br>Professor,KUROSE RYOUICHI<br>Graduate School of Engineering<br>Associate Professor,NAKAJIMA KAORU<br>Graduate School of Engineering<br>Associate Professor,KOUNO DAISUKE<br>Graduate School of Engineering<br>Professor,KOMORI MASAHARU |

| Target year | | Number of credits | 1 | Course offered year/period | 2019/Second semester |
|---|---|---|---|---|---|
| Day/period | Thu.1 | Class style | Seminar | Language | English |

**[Outline and Purpose of the Course]**

This seminar provides master-course students an opportunity of face-to-face group discussions to exchange ideas and information with those from other research fields. It is also emphasized in this seminar to give the attendees a chance to boost up the presentation skills necessary to broaden their own expertise across multidisciplinary research fields. The primal aim is to offer these significant experiences of leadership as a young scientist with broad perspective in the global community.

**[Course Goals]**

Students will be able to acquire presentation and logical thinking skills.

**[Course Schedule and Contents]**

Self introduction,1-2times,
Organizing groups,1time,
Group activity,10-12times,Each group chooses an activity theme, and pursue the goal through discussion in the group. Weekly reports on the activity are required.
Final presentation,1-2times,Each group gives presentation of its final resutls.

**[Class requirement]**

None

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

Based on Group Activity Reports and Personal Report

**[Textbook]**

Not used

**[Reference books, etc.]**

**（Reference books）**

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

Group activities

**（Others (office hour, etc.)）**

All activities should be done in English.
Registration is required by the deadline. Contact at
cme-seminar@me.kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

| Numbering code | G-LAS00 80001 LJ20 | | |
|---|---|---|---|
| Course title <English> | 研究倫理・研究公正（理工系）<br>Research Ethics and Integrity(Science and Technology) | Affiliated department, Job title,Name | Institute for Liberal Arts and Sciences<br>Program-Specific Professor,ITO SHINZABUROU<br>Institute for Liberal Arts and Sciences<br>Program-Specific Professor,SATOU TOORU<br>Graduate School of Engineering<br>Professor,KAWAKAMI YOUICHI |

| Group | Common Graduate Courses | Field(Classification) | Social Responsibility and Profitability |
|---|---|---|---|

| Language | Japanese | Old group | | Number of credits | 0.5 |
|---|---|---|---|---|---|

| Hours | 7.5 | Class style | Lecture | Course offered year/period | 2019・<br>Intensive, First semester |
|---|---|---|---|---|---|

| Day/period | Intensive | Target year | Graduate students | Eligible students | For science students |
|---|---|---|---|---|---|

**[Outline and Purpose of the Course]**

研究をこれから始める大学院生に責任ある行動をする研究者として身につけておくべき心構えを講述する。研究者としての規範を保っていかに研究を進めるか、また研究成果の適切な発表方法など、研究倫理・研究公正についてさまざまな例を示しながら、科学研究における不正行為がいかに健全な科学の発展の妨げになるか、またデータの正しい取扱いや誠実な研究態度、発表の仕方が、自らの立場を守るためにもいかに重要かを講義する。さらに、研究費の適切な使用と知的財産や利益相反について学ぶ。講義に続いてグループワークを行い、与えられた仮想課題を自らの問題として考え、解決方法のディスカッションを行う。

**[Course Goals]**

第１講～第４講を通じて、研究者としての責任ある行動とは何かを修得する。科学研究における不正行為の事例学習、討論を通じて、誠実な研究活動を遂行する研究者の心得を身につけ、最後に研究倫理・研究公正についてのe-ラーニングコースを受講し、理解度を確認する。

**[Course Schedule and Contents)]**

第１講　科学研究における心構え－研究者の責任ある行動とは－
１．研究者の責任ある行動とは（学術活動に参加する者としての義務）
２．不正の可能性と対応
３．実験室の安全対策と環境への配慮
４．データの収集と管理－実験データの正しい取扱い方－
５．科学上の間違いと手抜き行為の戒め
６．誠実な研究活動中の間違いとの区別
７．科学研究における不正行為
第２講　研究成果を発表する際の研究倫理公正
１．研究成果の共有
２．論文発表の方法とプロセス
３．科学研究における不正行為（典型的な不正）
４．データの取扱い（データの保存・公開・機密）
５．その他の逸脱行為（好ましくない研究行為）
６．研究不正事件（シェーン捏造事件）
７．不適切な発表方法（オーサーシップ、二重投稿）
第３講　知的財産と研究費の適正使用
１．知的財産の考え方（知的財産の確保と研究発表）
２．研究資金と契約

Continue to 研究倫理・研究公正（理工系）(2)↓↓↓

研究倫理・研究公正（理工系）(2)

３．利益相反（利害の衝突と回避）
４．公的研究費の適切な取扱い
５．研究者・研究機関へのペナルティー
６．事例紹介（ビデオ：分野共通４件）
７．結語
第４講　グループワーク
１．例示された課題についてグループ・ディスカッションと発表
２．日本学術振興会「研究倫理ラーニングコース」の受講と修了証書の提出

**[Class requirement]**

None

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

第１～４講の全てに出席と参加の状況、ならびに学術振興会e-learningの修了証の提出をもって合格を判定する。

**[Textbook]**

日本学術振興会「科学の健全な発展のために」編集委員会 『科学の健全な発展のために－ 誠実な科学者の心得－』（丸善出版）ISBN:978-4621089149（学術振興会のHP（https://www.jsps.go.jp/j-kousei/data/rinri.pdf）より、テキスト版をダウンロード可能）

**[Reference book, etc.]**

（Reference book）
米国科学アカデミー 編、池内 了 訳 『科学者をめざす君たちへ―研究者の責任ある行動とは』（化学同人）ISBN:978-4759814286
眞嶋俊造、奥田太郎、河野哲也編著 『人文・社会科学のための研究倫理ガイドブック』（慶応義塾大学出版会）ISBN:978-4766422559
神里彩子、武藤香織編 『医学・生命科学の研究倫理ハンドブック』（東京大学出版会）ISBN:978-4130624138
野島高彦著 『誰も教えてくれなかった実験ノートの書き方』（化学同人）ISBN:978-4759819335
須田桃子著 『捏造の科学者 STAP細胞事件』（文藝春秋）ISBN:978-4163901916

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

日本学術振興会「研究倫理ラーニングコース」の受講

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

第１～３講は土曜２，３，４限に行う。第４講はグループワークを中心として講義の翌週または翌々週の土曜１，２または３，４限に実施する。

| Numbering code | G-LAS00 80004 LJ44 | | |
|---|---|---|---|
| Course title <English> | 知的財産<br>Intellectual Property | Affiliated department, Job title,Name | Office of Society-Academia Collaboration for Innovation<br>Endowed Research Professor,KITANI TETSUO<br>Office of Society-Academia Collaboration for Innovation<br>Project Professor,KAWABATA TADASHI |
| Group | Common Graduate Courses | Field(Classification) | Social Responsibility and Profitability |
| Language | Japanese | Old group | Number of credits: 0.5 |
| Hours | 7.5 | Class style | Lecture |
| Course offered year/period | 2019・<br>Intensive, First semester | | |
| Day/period | Intensive | Target year | Graduate students |
| Eligible students | For all majors | | |

**[Outline and Purpose of the Course]**

経済活動を支える手段として「知的財産」「知的財産権」（以下まとめて「知財」という。）は重要なファクターとなっている。
　「知財」は、ライバル企業による模倣の制止（侵害訴訟）だけでなく、企業間の協力（ライセンス、パテント・プール）、研究開発力向上（職務発明制度）などの面で利用され、企業の競争力を高めるための手段として活用されている。また、大学も例外でなく、その研究成果の社会実装に向けて、企業との共同研究、ベンチャー企業育成などに取り組んでいるが、こうした活動において「知財」ルールをうまく取り決めないと将来の研究活動に制限をうけるリスクが生じる。
　本授業では、「知財」についての基本的知識とともに、企業や大学の具体的な活動事例に基づきながら、「知財」の活用方法についての考え方を習得することを目的とする。

　※「知的財産」とは、（１）発明、考案、植物新品種、意匠、著作物など、人間の創造的活動により生み出されるもの、（２）商標、商号その他の事業活動に用いられる商品または役務を表示するもの、および（３）営業秘密その他の事業活動に有用な技術上または営業上の情報をいう。
　※「知的財産権」とは、特許権、実用新案権、育成者権、意匠権、著作権、商標権その他の知的財産に関して法令により定められた権利または法律上保護される利益に係る権利をいう。

**[Course Goals]**

本講座では、
①知的財産の概要
②知財戦略の基本的な考え方
③企業、ベンチャーや大学における知財活用（取り組み事例）
④権利取得や知財契約の種類と考え方
⑤先行技術情報検索手法についての基礎的な知識
の習得を目的とする。

**[Course Schedule and Contents)]**

①知的財産の概要
②知財戦略の基本的な考え方
③企業、ベンチャーや大学における知財活用（取り組み事例）
④権利取得や知財契約の種類と考え方
⑤先行技術情報検索手法についての基礎的な知識

上記①から⑤について、全４回で授業する。

そのほか、必要に応じて、以下を行う。

Continue to 知的財産(2)↓↓↓

**知的財産(2)**

**・専門家（弁護士、企業知財担当者など）を招へいし、特許戦略や特許訴訟など企業の具体的取組事例を紹介**
**・京都大学における産学連携の取組、知財活動を紹介。**

**[Class requirement]**

None

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

**レポート：**60%
**平常点評価（出席状況）：**40%

**[Textbook]**

Not fixed

**[Reference book, etc.]**

**（Reference book）**
Introduced during class

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

**特になし**

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

**授業中に紹介する**