科目コード (Code)	科目名 (Course title)	Course title (English)
10H002	移動現象特論	Transport Phenomena
10H005	分離操作特論	Separation Process Engineering, Adv.
10H009	Chemical Reaction Engineering, Adv.	Chemical Reaction Engineering, Adv.(English lecture)
10H053	プロセスデータ解析学	Process Data Analysis
10H017	微粒子工学特論	Fine Particle Technology, Adv.
10H020	界面制御工学	Surface Control Engineering
10H021	化学材料プロセス工学	Engineering for Chemical Materials Processing
10H023	環境システム工学	Environmental System Engineering
10E038	プロセス設計	Process Design
10H030	化学工学特論第一	Special Topics in Chemical Engineering I
10H035	化学工学特論第四	Special Topics in Chemical Engineering IV
10E041	研究インターンシップ（化学工学）	Research Internship in Chemical Engineering
10P043	化学工学セミナー１	Chemical Engineering Seminar I
10P044	化学工学セミナー２	Chemical Engineering Seminar II
10P045	化学工学セミナー３	Chemical Engineering Seminar III
10P046	化学工学セミナー４	Chemical Engineering Seminar IV
10E045	化学工学特別実験及演習Ⅰ	Research in Chemical EngineeringI
10E047	化学工学特別実験及演習Ⅱ	Research in Chemical EngineeringII
10E049	化学工学特別実験及演習Ⅲ	Research in Chemical EngineeringIII
10E051	化学工学特別実験及演習Ⅳ	Research in Chemical EngineeringIV
10i061	先端マテリアルサイエンス通論（4回コース）	Introduction to Advanced Material Science and Technology(4 times course)
10i062	先端マテリアルサイエンス通論（8回コース）	Introduction to Advanced Material Science and Technology(8 times course)
10i063	先端マテリアルサイエンス通論（12回コース）	Introduction to Advanced Material Science and Technology(12 times course)
10i055	現代科学技術特論（4回コース）	Advanced Modern Science and Technology(4 times course)
10i056	現代科学技術特論（8回コース）	Advanced Modern Science and Technology(8 times course)
10i060	現代科学技術特論（12回コース）	Advanced Modern Science and Technology(12 times course)
10D043	先端科学機器分析及び実習I	Instrumental Analysis,Adv.I
10D046	先端科学機器分析及び実習II	Instrumental Analysis,Adv.II
10i049	エンジニアリングプロジェクトマネジメント	Project Management in Engineering
10i059	エンジニアリングプロジェクトマネジメント演習	Exercise on Project Management in Engineering
10i057	安全衛生工学（4回コース）	Safety and Health Engineering(4 times course)
10i058	安全衛生工学（11回コース）	Safety and Health Engineering(11 times course)
10P470	JGP計算実習(CFD)	Japan Gateway Project Computation Exercise(CFD)
10P471	JGP計算実習(MO)	Japan Gateway Project Computation Exercise(MO)
88G101	研究倫理・研究公正（理工系）	Research Ethics and Integrity(Scienceand Technology)
88G201	学術研究のための情報リテラシー基礎	Basics of Academic Information Literacy
88G301	大学院生のための英語プレゼンテーション	Presentation for Graduate Students

未更新

Numbering code			
Course title <English>	移動現象特論 Transport Phenomena	Affiliated department, Job title,Name	Graduate School of Engineering Professor,YAMAMOTO RYOICHI

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Tue.4	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

After general introductions on the flow properties (Rheology) of polymeric liquids as typical examples of non-Newtonian fluids, the relationship (known as the constitutive equation) between strain rate and stress is explained. In addition to classical phenomenological approaches, molecular approaches based on statistical mechanics will be taught in this course. To this end, basic lectures on “Langevin Equation”, “Hydrodynamic Interaction”, and “Linear Response Theory” will also be given.

[Course Goals]

To understand strength and weakness of both phenomenological and molecular approaches to formulate general behaviors of non-Newtonian fluids mathematically as forms of constitutive equations. Also to learn mathematical and physical methodologies necessarily to achieve this.

[Course Schedule and Contents]

- Polymeric Liquids / Rheology 6 Shedding lights on the nature of polymeric liquids in comparisons with simple Newtonian liquids. Various formulations on the characteristic behaviors of polymeric liquids based on both empirical and molecular approaches are lectured.
- Stochastic Process / Langevin Equation 3 To deal with Brownian motions of particles in solvents, a lecture on Langevin equation is given after some basic tutorials on stochastic process.
- Green Function / Hydrodynamic Interaction 2 To deal with motions of interacting particles in solvents, a lecture on the hydrodynamic interaction is given after some basic tutorials on Green function and Poisson equation.

Understanding Check 1

[Class requirement]

Under graduate level basic knowledge on “Fluid Mechanics / Transport Phenomena” and basic mathematics including “Vector Analyses” are required.

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

Answers to several questions and exercises, which will be given during the course, are used to judge.

[Textbook]

Bird, Stewart 『Transport Phenomena 2nd Ed』 (Lightfoot, (Wiley))

[Reference books, etc.]

(Reference books)

Doi 『Introduction to Polymer Physics』 (Oxford)

Continue to 移動現象特論 (2)↓↓↓

移動現象特論 (2)

Hansen, McDonald 『Theory of Simple Liquids 4th Ed』 （Academic Press）
Russel 『Colloidal Dispersions』 （Saville, and Schowlter, (Cambridge)）

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

（Others (office hour, etc.)）

This is an biennial course which will be open in 2016, 2018, 2020, ...

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	分離操作特論 Separation Process Engineering, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Mon.2	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

The separation related with transport phenomena of heat and mass and particles will be lectured. Adsorption, drying, distillation will be explained. In addition, new separation methods will be explained.

[Course Goals]

This course will deepen the students#039 understanding on multiphase transport phenomena by lecturing separation operations, and the students will know how to develop effective separation methods. Also they will know recent developments of separation techniques in chemical engineering.

[Course Schedule and Contents]

Separation using electric field,2times,Purification of gas and water using electric discharges and particle separation using dielectrophoresis are explained.
Distillation,3times,Distillation is used commonly in chemical industries. Here, advanced knowledge on distillation about multi-component distillation, equipment design using enthalpy-component diagram, extraction distillation, etc. will be explained.
Adsorption,3times,Analysis using adsorption is used for structural analysis of porous materials, and it is important to evaluate adsorbents. Here, basic knowledge about these analysis will be explained. When one wants to select appropriate adsorbents, features and properties of typical adsorbents should be known. These points will be lectured. Also, some methods to synthesize adsorbents from waste materials are explained.
Drying mechanism and preservation of product quality,2times,Drying is a typical operation utilizing phase transformation and simultaneous transport of heat and mass. A variety of drying units are explained, and the points to designing these units will be lectured. Many examples of troubles seen in drying operations will be explained.
Other separation operations,1time,Other separation operations, for example liquid-liquid extraction, membrane separation, etc. will be lectured.

[Class requirement]

Basic knowledge about transport phenomena and separation engineering should be required.

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

Reports submitted from students and exams will be evaluated.

Continue to 分離操作特論(2)↓↓↓

分離操作特論(2)

[Textbook]

Gendai Kagaku Kogaku Hashimoto and Ogino, Sangyo Tosho; Kanso Gijustu Jitsumu Nyumon Tamon, Nikkan Kogyo Shinbun

[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>	Chemical Reaction Engineering, Adv. Chemical Reaction Engineering, Adv.(English lecture)	Affiliated department, Job title,Name	Graduate School of Engineering Professor,KAWASE MOTOAKI Graduate School of Engineering Associate Professor,NAKAGAWA HIROYUKI Graduate School of Engineering Senior Lecturer,ASHIDA RIYUUICHI

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Wed.3	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

This lecture is given in English. The following contents are covered: - Kinetic analysis of gas-solid-catalyst reaction, gas-solid reaction, and CVD reaction, - Operation and design of reactors for gas-solid-catalyst and gas-solid reactions, and - Industrial reactors including fixed bed, fluidized bed, moving bed, simulated moving bed, and stirred tank types.

[Course Goals]

To understand kinetic analysis of chemical reactions utilized in the industry and procedure to design and operate industrial reactors.

[Course Schedule and Contents]

Gas-solid-catalyst reaction (1) Fundamentals 1 Commercial catalysts and industrial gas-solid-catalyst reactions are overviewed. Chemical reaction engineering fundamentals of the gas-solid-catalyst reaction is explained.
Gas-solid-catalyst reaction (2) Generalized effectiveness factor and selectivity in complex reactions 1 The generalized effectiveness factor and the selectivity affected by mass transfer are explained.
Gas-solid-catalyst reaction (3) Deactivation and regeneration of catalyst 2 Deactivation mechanisms of solid catalysts are overviewed. The deactivation and consequent change in selectivity are explained in terms of the decay function and specific activity.
Gas-solid-catalyst reaction (4) Design and operation of industrial catalytic reactors 1 Industrial catalytic reactors including fixed-bed and fluidized-bed reactors are overviewed. Design and operation of these reactors including thermal stability are explained.
Liquid-solid-catalyst reaction -- Simulated moving bed reactor 1 Concept and applications of simulated moving bed reactor are explained. Model-based analysis of simulated moving bed reactor is explained.
CVD reaction 2 Fundamentals of CVD reactions are explained from chemical reaction engineering view point. Kinetic analysis of CVD is described. Reaction models including elementary reaction model and overall reaction model are derived and applied to some examples.
Gas-solid reaction (1) Kinetic analysis 2 Kinetic measurement and analysis of complicated gas-solid reactions, particularly coal pyrolysis, are explained with the first-order reaction model to the distributed activation energy model (DAEM).
Gas-solid reaction (2) Kinetic analysis of gas-solid reaction 1 Concepts and derivation of the reaction models including the grain model and the random-pore model are explained. Application of the models to coal gasification is overviewed.

Continue to Chemical Reaction Engineering, Adv. (2)↓↓↓

Chemical Reaction Engineering, Adv. (2)

[Class requirement]

Needs knowledge of chemical reaction engineering including heterogeneous reactions.

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

Based on the result of examination at the end of term and the results of quizzes and reports imposed every week.

[Textbook]

Prints are hand out at the class.

[Reference books, etc.]

（Reference books）

特になし

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

未記入

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code	G-ENG17 5H053 LJ76				
Course title <English>	プロセスデータ解析学 Process Data Analysis	Affiliated department, Job title,Name	Not fixed		
Target year		Number of credits	1.5	Course offered year/period	2019/Second semester
Day/period	Tue.2	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

操業データを活用して，製品品質予測，生産性向上などを実現するための方法論の修得を目的とする．確率・統計学の基礎，相関分析，回帰分析，多変量解析（主成分分析，判別分析，PLSなど）の基本手法，およびその応用（ソフトセンサー設計など）について講述する．

[Course Goals]

データ解析手法を修得し，ソフトセンサー設計や多変量統計的プロセス管理などに応用できる力を身に付ける．

[Course Schedule and Contents]

データ解析のための準備（1回）
講義の目的と内容を理解し，平均，分散，相関係数などのデータ解析の基礎となる用語の意味とその計算法を学ぶ．

確率・統計学の基礎（1回）
確率分布（特に正規分布），期待値など確率・統計学の基礎を学ぶと共に，データを母集団から得られた標本と考えた取り扱いについて学習する．

線形代数のまとめ（1回）
固有値，固有ベクトル，変数ベクトルの期待値や分散，共分散の行列を用いた計算法，写像の概念など，データ解析で必要な線形代数の基礎知識について理解を深める．

回帰分析（2回）
２変数間の因果関係を探るための単回帰分析をまず理解する．そして，重回帰式の構築と評価，偏回帰係数の意味と区間推定，説明変数の選択方法について学習すると共に，多重共線性の問題を理解する．

EXCELを用いた演習（1回）
これまで説明してきた内容について，EXCEL大規模データを用いて実際に計算する．そして，その中で異常値の取り扱いについて体得する．

主成分分析（1回）
多変数間の関係を，低い次元の合成変数（主成分）間の関係に変換する主成分分析の考え方とその計算法を理解する．

PLS（1回）
多重共線性が問題となるデータに対する解析手法であるPLSについて，その原理を理解し，計算法を把握する．

Continue to プロセスデータ解析学(2)↓↓↓

プロセスデータ解析学(2)

判別分析（1回）
あるサンプルが2つの母集団のどちらに属するかを求める手法である判別分析の考え方を理解する．

ソフトセンサー（2回）
簡単に測定できない変数を，容易に測定可能な変数から推定するソフトセンサーの構築法を学び，実際に適用する際の問題点を理解する．そして，実社会ににおいて多くの応用例があることを実例から学ぶ．

[Class requirement]

None

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

レポートと期末試験結果を総合的に判断して評価する．

[Textbook]

永田，棟近『多変量解析法入門』（サイエンス社）
不足内容については資料を配付する．

[Reference books, etc.]

（Reference books）
特になし

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

未入力

（Others (office hour, etc.)）

隔年開講科目

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	微粒子工学特論 Fine Particle Technology, Adv.	Affiliated department, Job title,Name	Graduate School of Engineering Professor,MATSUSAKA SHIYUUJI

Target year		Number of credits	1.5	Course offered year/period	2019/Second semester

Day/period	Mon.2	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

Lectures focus on particle system operation and measurement methods, chiefly regarding the behavior and mechanical (kinetic) analysis of gas-phase dispersed particles. Theoretical explanation is also made of the particle charging phenomenon, which has a major impact on the behavior of gas-phase dispersed particles. Also discussed are the control of electrical charge and related application technologies.

[Course Goals]

Students will gain an understanding of the concepts underpinning particle dynamic analysis methods and will also foster their skills in overall particle-system operation applications.

[Course Schedule and Contents]

Various particle properties and different types of measurement methods (3 classes)
Explanation is made of the mathematical unified descript method for particle size distribution, properties related to the activity of functional fine particles, as well as methods for their measurement and analysis.

Particle adhesion and mechanical (kinetic) analysis (3 classes)
Lectures cover measurement methods for particle adhesion strength and collision and deformation mechanical analysis methods. The discrete element method is also explained.

Particle behavior in air flow (3 classes)
Using physical models and probability theory, explanation is made of temporal and spatial variation of deposition and re-entrainment of air-conveyed fine particles, which are important phenomena in actual processes. Also described are complex scattering phenomena that accompany collisions between particles.

Particle charge and control (2 classes)
Explanation is made of concepts regarding particle charging mechanisms and of quantitative analysis methods for charging processes. This will lead to the development of analysis methods that consider charge distribution. New control methods for particle charging are also introduced.

[Class requirement]

Students should have fundamental knowledge of undergraduate-level particle engineering.

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

Evaluation is performed based on test scores.

Continue to 微粒子工学特論(2)↓↓↓

微粒子工学特論(2)

[Textbook]

Lecture notes will be used.

[Reference books, etc.]

（Reference books）

K. Okuyama, H. Masuda and S. Morooka 『Biryuushi Kougaku: Fine particle technology』 （Ohmsha） ISBN:4-7828-2609-5

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

Students must prepare for classes, and review after classes.

（Others (office hour, etc.) ）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	界面制御工学 Surface Control Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,MIYAHARA MINORU

Target year		Number of credits	1.5	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]

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

[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>	化学材料プロセス工学 Engineering for Chemical Materials Processing	Affiliated department, Job title,Name	Graduate School of Engineering Professor,OOSHIMA MASAHIRO Graduate School of Engineering Associate Professor,NAGAMINE SHINSUKE Graduate School of Engineering Assistant Professor,HIKIMA YUUTA

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Wed.4	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

Focusing on transport phenomena (flow amp rheology, mass flux, heat flux) in polymer processing process, the key relationships among polymer properties, processing schemes, and processing machine are taught.

[Course Goals]

The objective of this course is to know how the polymers are different in terms of thermal, rheological and mechanical properties. The attendees learn what Tg, Tc, Tm, G#039 and G are, how those properties can be measured and how these obtained measurement data can be appreciated. Visual Observation movies relates those properties with the transport phenomena that occur in several polymer processing processes.

[Course Schedule and Contents]

Orientation amp Introduction of Polymer Processing, **1** times,The characteristics of polymers are reviewed by exercising the characterization of general polymers, like PE, PP, PLA, PC, PS, PVC in terms of appearance, thermal and mechanical properties.
State of Thermoplastic Polymer,1time,The relationship among pressure-volume-temperature of thermoplastic polymer is described. The way of identifying the Tg, Tc is taught. Several equations of state are introduced.
Thermal Properties of Thermoplastic Polymers,2times,Several important thermal properties of thermoplastic polymers, such as glass transition temp, Tg, crystallization temp, Tc, and melting temp, Tm are explained together with the measurement methods of those thermal properties. The latest measurement device, Flash DSC, is introduced with some of the interesting data of crystallization process.
Rheological Properties of Thermoplastic Polymers ,2times,The basic of polymer rheology, viscosity and elasticity, is given. Several phenomena of non-Newtonian fluid are introduced. The fundamental constitutive equations, Maxwell and Voigt models, describing the viscoelasticity of the polymers are explained. Exercising on identification of polymer structures, such as the degree of entanglement, molecular weight, presence of long-chain branch from the rheological data, relationship between polymer rheology and polymer structure is explained.
Basic Flows in Polymer Processing, **1** times,The basics of Polymer Processing are the series of Melt, Flow and Shape. Here the class focus on the Flow. The two types flow, i.e., drag and pressure flows are explained together with master equation. Without solving the mathematical equations, the skill of estimating the velocity profile is cultivated.
Visual Observation of Flow Phenomena in Processing Machine, **1** times,Entertaining several visual observation movies showing the flow phenomena in real polymer processing machine like injection molding machine and extruder, The effects of thermal and rheological properties of polymer on those flow phenomena are clarified.
Phase separation and Morphology Formation,2times,The basic of phase separation of polymer-polymer, polymer-solvent are taught.
Phase Separation Phenomena in Polymer Processing, **1** times,Several polymer processing schemes exploiting

Continue to 化学材料プロセス工学(2)↓↓↓

化学材料プロセス工学(2)

a phase separation phenomenon are introduced. Synergistic design of the polymer properties, processing scheme and processing machine is stressed.
Check what we learn,1time,During the class, plenty of quiz are given to check the understanding.

[Class requirement]

Basic of Transport Phenomena

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

40% midterm quiz, 60% exam at end

[Textbook]

Handout

[Reference books, etc.]

（Reference books）

Agassant, J.F., Polymer Processing: Principles and Modeling

[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>	環境システム工学 Environmental System Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,MAE KAZUHIRO Graduate School of Engineering Associate Professor,MAKI TAISUKE

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Tue.2	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

First, we overview the concept of environmentally benign chemical processing based on the causal relation between energy and environmental issues. Then, we discuss various new technologies for energy production and environmentally harmonized processes from the viewpoint of chemical engineering.

[Course Goals]

To learn methodology for system-up of environmentally benign process based on energy and exergy. To consider perspective of biomass and hydrogen utilization. To understand several environmental evaluation methods.

[Course Schedule and Contents]

Concept of environmentally benign system based on exergy,4times,Basic of exergy and calculation of exergy for various conversion process. The exercise will be conducted to confirm the understanding of exergy.

Biomass conversion,3times,Introduction of various conversion processes for baiomass and wastes from the view point of kinetics.

Environmental evaluation method (1),2times,Introduction of various environmental evaluation methods Calculation of LCA analysis

Environmental evaluation method (2),2times,Calculation of E-factor and environmental efficiency for sevaral chemical processes

Confirmation of study achievement,1time,Feedback of evaluation results for reports and exercises.

[Class requirement]

Basic knowledge for chemical engieering themodynamics is required.

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

Coursework will be graded based on the reports and the exercise in class.

[Textbook]

The textbook is not required. Materials will be supplied by instructors.

[Reference books, etc.]

（Reference books）

Pysical chemistry, Themodynamics

Continue to 環境システム工学(2)↓↓↓

環境システム工学(2)

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

Prepareation study is reqired to understand the exergy.

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	プロセス設計 Process Design	Affiliated department, Job title,Name	Not fixed

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

Day/period	Fri.3	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

The fundamental skills of designing chemical processes which consist of various unit operations are learned. Then, a conceptual design exercise of a chemical process is executed using the knowledge of chemical engineering and process simulation system.

[Course Goals]

It is requested to understand the way of conceptual design, and to have the skill of designing chemical processes by applying the knowledge of chemical engineering and related field.

[Course Schedule and Contents]

Concept of process design,1time,The assembly of the optimally designed unit operations does not result in the total optimum system. The concepts of the system boundary and the total optimal design are explained.
Computer-aided process design,1time,In an actual process design, use of a process simulator is indispensable. The design technique using the sequential modular approach, which is mainly used in the process simulator, is explained.
How to use process simulators,2times,How to use the process simulator which is widely used in the real process design is explained.
Reality of process design,6times,Process design consists of successive steps such as the acquisition of market research and data, process synthesis, and an equipment design. For these steps, the problems which should be taken into consideration are made clear, and the techniques which can be used at each step are explained.
Practice of a chemical process design, **1** times,The design exercise is executed by 2 to 3 students#039 group.
Oral presentation,4times,The design result at each group is presented at the oral session where all the faculty members attend.

[Class requirement]

The basic knowledge of chemical engineering such as the unit operation and reaction engineering are requested.

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

The results are evaluated by the contents of the final report and the oral presentation.

[Textbook]

Lecture materials are distributed in the class.

[Reference books, etc.]

（Reference books）

Continue to プロセス設計(2)↓↓↓

プロセス設計(2)

（Related URLs）

(http://www.cheme.kyoto-u.ac.jp/processdesign/)

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

The design exercise is executed by 2 to 3 students#039 group.

（Others (office hour, etc.)）

Each group of students is supervised by the professors of the affiliation laboratory. The credit obtained in this course cannot be counted as the credit for graduation if the students have taken the same subject at the undergraduate course of chemical process engineering.

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	化学工学特論第一 Special Topics in Chemical Engineering I	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,ALCANTARA AVILA, Jesus Rafael

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Tue.5	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

The increase of environmental awareness and more strict laws have urged Chemical Engineering to incorporate environment and safety criteria in the design and operation of chemical processes. This course will cover the fundamental concepts of energy and mass reuse, and disposal of chemicals through a series of lectures and exercises.

[Course Goals]

・ Develop the ability to apply the concepts of energy and mass reuse to enhance the performance of chemical processes.
・ Evaluate the potential harms to environment and health resulted from the release of chemicals.

[Course Schedule and Contents]

1. Worldwide energy supply and demand (energy consumption in Japan and the world)
2. Energy from fossil fuel sources
3. Renewable energy sources I (biomass)
4. Renewable energy sources II (solar, wind, coastal)
5. Energy utilization (waste heat energy, heat integration)
6. Energy efficiency enhancement (Cogeneration, Kalina cycle)
7. Mass utilization (Mass integration)
8. Assessment of chemical releases into the environment (impact on humans, ecosystem, sources)
9. Sustainable chemical processes and Green chemistry
10. Inherently safe processes
11. Life cycle impact assessment

[Class requirement]

Basic process design, mathematics

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

The grade will be evaluated as follows: final exam (60%) and assignments (5*8=40%).

Continue to 化学工学特論第一(2)↓↓↓

化学工学特論第一(2)

[Textbook]

Instructed during class
Any necessary textbook or material will be announced in class.

[Reference books, etc.]

（Reference books）

Nothing special

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

Undecided

（Others (office hour, etc.)）

Please check the office hours in KULASIS. However, another time possible upon reservation in advance.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	化学工学特論第四 Special Topics in Chemical Engineering IV	Affiliated department, Job title,Name	Part-time Lecturer,HIRANO SHIGEKI

Target year		Number of credits	1.5	Course offered year/period	2019/Second semester
Day/period	Tue.3	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,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.

Numbering code	G-ENG17 8E041 PB76		
Course title <English>	研究インターンシップ（化工） Research Internship in Chemical Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

Target year		Number of credits	2	Course offered year/period	2019/Intensive, year-round

Day/period	Intensive	Class style	Practical training	Language	English

[Outline and Purpose of the Course]

専攻として企画・実施しているドイツ国でのインターンシップについて，滞在先および帰国後の報告会により成績を評定し，単位認定を行なう．なお，専攻で指定する他のインターンシップも含まれる。

[Course Goals]

１．外国企業・外国文化の中での自己実践
２．世界的企業の研究活動に関する経験・知見の蓄積
３．語学（英語）力の向上と異なる背景を持つ人とのコミニュケーション力の向上
これらの達成度は、英語で実施する研修報告会を通して、評価・判断する。

[Course Schedule and Contents]

国際インターンシップ（27回）成績優秀な日本人学生をドルトムント工科大学を管理拠点として、EU企業に派遣し、2か月間のインターンシップ研修を受けさせ、日本とは異なる国での企業倫理、ものづくりの在り方ならびにヨーロッパ文化を学ばせる。
成果報告（2回）日本ならびにドイツにおいてそれぞれ1回ずつ、あわせて2回の研修報告会を英語で実施する。
国際交流会（2回）日独双方の学生がインターンシップで経験し学んだことを互いに発表し合い、意見交換を行うセミナーを開催し、専門分野のみならず、それぞれの国の文化についての体得させる。

[Class requirement]

None

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

成果報告（英語による口頭発表および質疑）

[Textbook]

Not fixed

[Reference books, etc.]

（Reference books）

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

渡航の準備は各自で行う。

（Others (office hour, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	化学工学セミナー１ Chemical Engineering Seminar I	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

Target year		Number of credits	0.5	Course offered year/period	2019/Intensive, First semester
Day/period	Intensive	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,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.

未更新

Numbering code			
Course title <English>	化学工学セミナー２ Chemical Engineering Seminar II	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

Target year		Number of credits	0.5	Course offered year/period	2019/Intensive, Second semester
Day/period	Intensive	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,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.

未更新

Numbering code			
Course title <English>	化学工学セミナー３ Chemical Engineering Seminar III	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

Target year		Number of credits	0.5	Course offered year/period	2019/Intensive, First semester
Day/period	Intensive	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,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.

未更新

Numbering code			
Course title <English>	化学工学セミナー４ Chemical Engineering Seminar IV	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

Target year		Number of credits	0.5	Course offered year/period	2019/Intensive, Second semester
Day/period	Intensive	Class style	Lecture	Language	Japanese and English

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,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.

未更新

Numbering code			
Course title <English>	化学工学特別実験及演習Ⅰ Research in Chemical EngineeringI	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

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

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,5times,
,5times,
,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>	化学工学特別実験及演習II Research in Chemical EngineeringII	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

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

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,4times,
,6times,
,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>	化学工学特別実験及演習III Research in Chemical EngineeringIII	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

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

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,3times,
,6times,
,12times,

[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>	化学工学特別実験及演習IV Research in Chemical EngineeringIV	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SANO NORIAKI

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

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,3times,
,4times,
,12times,
,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>	先端マテリアルサイエンス通論（4回コース） Introduction to Advanced Material Science and Technology (4 times course)	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year		Number of credits	0.5	Course offered year/period	2019/First semester

Day/period	Fri.5	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

The various technologies used in the field of material science serve as bases for so-called high technologies, and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

[Course Goals]

To expand your field of vision for material science and to acquire accomplishments to identify the importance of technologies through the classes for developments in material science.

[Course Schedule and Contents]

Topic I Organic Materials
Week 1, Tumor imaging and therapy through photoirradiation
Week 2, Carbon nanorings
Week 3, Synthesis of novel pai-conjugated molecules with main group elements
Week 4, Chemistry of asymmetric catalysis - stereoselective synthesis of opically active pharmaceutical compounds -
Topic II Inorganic Materials
Week 5, Properties of cementitious materials and the future
Week 6, Application of electrical discharge to material and environmental technology
Week 7, Theory of precision cuting, grinding, polishing and related properties of materials
Week 8, Fabrication of inorganic nanofiber by electrospinning
Topic III Polymeric Materials
Week 9-10, Electrical conductivity of conjugated polymers and application to organic Electronics
Week 11-12, An introduction to smart shape changing materials

[Class requirement]

Each topic consists of four lectures.
This course requests to choose one topic from provided three topics in advance.
It is prohibited to change the topic after registration.
We may select students who can attend the class before starting the class.
Students who intend to join the course are required to submit the application form through the web site which will be informed in the advance.

Continue to 先端マテリアルサイエンス通論（4回コース）(2)↓↓↓

先端マテリアルサイエンス通論（4回コース）(2)

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

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

[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 topics 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.

Numbering code			
Course title <English>	先端マテリアルサイエンス通論（8回コース） Introduction to Advanced Material Science and Technology (8 times course)	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year		Number of credits	1	Course offered year/period	2019/First semester

Day/period	Fri.5	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

The various technologies used in the field of material science serve as bases for so-called high technologies, and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

[Course Goals]

To expand your field of vision for material science and to acquire accomplishments to identify the importance of technologies through the classes for developments in material science.

[Course Schedule and Contents]

Topic I Organic Materials
Week 1, Tumor imaging and therapy through photoirradiation
Week 2, Carbon nanorings
Week 3, Synthesis of novel pai-conjugated molecules with main group elements
Week 4, Chemistry of asymmetric catalysis - stereoselective synthesis of opically active pharmaceutical compounds -
Topic II Inorganic Materials
Week 5, Properties of cementitious materials and the future
Week 6, Application of electrical discharge to material and environmental technology
Week 7, Theory of precision cuting, grinding, polishing and related properties of materials
Week 8, Fabrication of inorganic nanofiber by electrospinning
Topic III Polymeric Materials
Week 9-10, Electrical conductivity of conjugated polymers and application to organic Electronics
Week 11-12, An introduction to smart shape changing materials

[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.
We may select students who can attend the class before starting the class.
Students who intend to join the course are required to submit the application form through the web site which will be informed in the advance.

Continue to 先端マテリアルサイエンス通論（8回コース）(2)↓↓↓

先端マテリアルサイエンス通論（8回コース）(2)

[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".

[Textbook]

Not used

[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.

Numbering code			
Course title <English>	先端マテリアルサイエンス通論（12回コース） Introduction to Advanced Material Science and Technology (12 times course)	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Fri.5	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

The various technologies used in the field of material science serve as bases for so-called high technologies, and, in turn, the high technologies develop material science. These relate to each other very closely and contribute to the development of modern industries. In this class, recent progresses in material science are briefly introduced, along with selected current topics on new biomaterials, nuclear engineering materials, new metal materials and natural raw materials. The methods of material analysis and future developments in material science are also discussed.

[Course Goals]

To expand your field of vision for material science and to acquire accomplishments to identify the importance of technologies through the classes for developments in material science.

[Course Schedule and Contents]

Topic I Organic Materials
Week 1, Tumor imaging and therapy through photoirradiation
Week 2, Carbon nanorings
Week 3, Synthesis of novel pai-conjugated molecules with main group elements
Week 4, Chemistry of asymmetric catalysis - stereoselective synthesis of opically active pharmaceutical compounds -
Topic II Inorganic Materials
Week 5, Properties of cementitious materials and the future
Week 6, Application of electrical discharge to material and environmental technology
Week 7, Theory of precision cuting, grinding, polishing and related properties of materials
Week 8, Fabrication of inorganic nanofiber by electrospinning
Topic III Polymeric Materials
Week 9-10, Electrical conductivity of conjugated polymers and application to organic Electronics
Week 11-12, An introduction to smart shape changing materials

[Class requirement]

Each topic consists of four lectures.
This course requests to take all provided three topics.
We may select students who can attend the class before starting the class.
Students who intend to join the course are required to submit the application form through the web site which will be informed in the advance.

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

The average score of the best two assignments for each topics is employed.
For each topic, the students must attend minimum three lectures and submit minimum two assignments

Continue to 先端マテリアルサイエンス通論（12回コース）(2)↓↓↓

evaluated as "passed".

[Textbook]

Not used

[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.

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	現代科学技術特論（4回コース） Advanced Modern Science and Technology (4 times course)	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,ASHIDA RIYUUICHI Graduate School of Engineering Senior Lecturer,MATSUMOTO RIYOUSUKE Graduate School of Engineering Senior Lecturer,MAEDA MASAHIRO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year		Number of credits	0.5	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 one topic from provided three topics in advance.
It is prohibited to change the topic after registration.

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

The average score of the best two assignments is employed.
For the 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（4回コース）(2)↓↓↓

現代科学技術特論（4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 topics 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.

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

Numbering code			
Course title <English>	現代科学技術特論（12回コース） Advanced Modern Science and Technology (12 times course)	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,ASHIDA RIYUUICHI Graduate School of Engineering Senior Lecturer,MATSUMOTO RIYOUSUKE Graduate School of Engineering Senior Lecturer,MAEDA MASAHIRO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU

Target year		Number of credits	1.5	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 take all provided three topics.

Continue to 現代科学技術特論（12回コース）(2)↓↓↓

現代科学技術特論（12回コース）(2)

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

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

[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.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	先端科学機器分析及び実習Ⅰ Instrumental Analysis,Adv.I	Affiliated department, Job title,Name	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	1	Course offered year/period	2019/First semester
Day/period	Thu.4,5	Class style	Seminar	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,2times,
,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.

未更新

Numbering code			
Course title <English>	先端科学機器分析及び実習II Instrumental Analysis,Adv.II	Affiliated department, Job title,Name	Graduate School of Engineering Professor,OOE KOUICHI

Target year		Number of credits	1	Course offered year/period	2019/Second semester
Day/period	Thu.4,5	Class style	Seminar	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,1time,
,2times,
,2times,
,2times,
,2times,
,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>	エンジニアリングプロジェクトマネジメント Project Management in Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,MATSUMOTO RIYOUSUKE Graduate School of Engineering Senior Lecturer,ASHIDA RIYUUICHI Graduate School of Engineering Senior Lecturer,MAEDA MASAHIRO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Associate Professor,Juha Lintuluoto

Target year		Number of credits	2	Course offered year/period	2019/First semester
Day/period	Fri.4	Class style	Lecture	Language	English

[Outline and Purpose of the Course]

This course provides a basic knowledge required for the project management in various engineering fields such as process design, plant design, construction, and R&D project. Some lectures are provided by visiting lecturers from industry and public works who have many experiences on actual engineering projects.

[Course Goals]

This course will help students gain a fundamental knowledge of what project management in engineering is. Throughout the course, students will learn various tools applied in project management. Students will also understand the importance of costs and money, risks, leadership, and environmental assessment in managing engineering projects. This course is followed with the course Exercise on Project Management in Engineering in the second semester.

[Course Schedule and Contents]

Week 1, Course guidance
Week 2-3, Introduction to project management
Week 4, Project scheduling
Week 5-7, Tools for project management, cost, and cash flows
Week 8-9, Team organization and administration
Week 10, Negotiation skills/tactics/examples in business marketing
Week 11, Environmental impact assessment
Week 12-13, Risk management
Week 14, Project management for engineering procurement construction business
Week 15, Feedback

[Class requirement]

We may restrict the class size to enhance students' learning.
Students who intend to join the course are required to attend the first class.

Continue to エンジニアリングプロジェクトマネジメント(2)↓↓↓

エンジニアリングプロジェクトマネジメント(2)

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

Evaluated by class contribution (or level of understanding) at each class (60%) and assignments (40%)

[Textbook]

Course materials will be provided.

[Reference books, etc.]

（Reference books）

Lock, Dennis 『Project Management, 10th edition』 （Gower Publishing Ltd.）ISBN:1409452697
Cleland, David L., and Ireland, Lewis R. 『Project Management: Strategic Design and Implementation, 5th edition』 （McGraw-Hill Professional）ISBN:007147160X
Miller, Roger and Lessard, Donald R. 『The strategic management of large engineering projects, Shaping Institutions, Risks, and Governance』 （The MIT Press）ISBN:9780262526982

（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.)）

We may restrict the class size to enhance students' learning.
Students who intend to join the course are required to attend the first class.

*Please visit KULASIS to find out about office hours.

Numbering code			
Course title <English>	エンジニアリングプロジェクトマネジメント演習 Exercise on Project Management in Engineering	Affiliated department, Job title,Name	Graduate School of Engineering Senior Lecturer,MATSUMOTO RIYOUSUKE Graduate School of Engineering Senior Lecturer,ASHIDA RIYUUICHI Graduate School of Engineering Senior Lecturer,MAEDA MASAHIRO Graduate School of Engineering Senior Lecturer,YOROZU KAZUAKI Graduate School of Engineering Senior Lecturer,KANEKO KENTAROU Graduate School of Engineering Associate Professor,Juha Lintuluoto

Target year		Number of credits	2	Course offered year/period	2019/Second semester
Day/period	Fri.4,5	Class style	Seminar	Language	English

[Outline and Purpose of the Course]

In this course, students will apply the engineering know-how and the skills of management, and group leadership which they learned in the course of Project Management in Engineering to build and carry out a virtual inter-engineering project. This course provides a forum where students' team-plan based on ideas and theories, decision making, and leadership should produce realistic engineering project outcomes. The course consists of intensive group work, presentations, and a few intermediate discussions. A final report will be required.

[Course Goals]

This course prepares engineering students to work with other engineers within a large international engineering project. In particular this course will focus on leadership and management of projects along with applied engineering skills where the students learn various compromises, co-operation, responsibility, and ethics.

[Course Schedule and Contents]

Week 1, Introduction to Exercise on Project Management in Engineering, Lecture on tools for the Project management in engineering, Practice and Project proposal.
Week 2, Group finalizations & Project selections.
Week 3-7, Group work, Project preliminary structures, Task list, WBS, Cost, Gant chart.
Week 8, Mid-term presentation.
Week 9-11, Group work, Leadership structuring, Risk Management, Environmental Impact Assessment.
Week 12, Presentation.
Each project group may freely schedule the group works within given time frame. The course instructors are available if any need is required.
Some lectures will be provided such as Task list, WBS, Cost, Gant chart, Leadership structuring, Risk Management, Environmental Impact Assessment, and more.

Continue to エンジニアリングプロジェクトマネジメント演習(2)↓↓↓

エンジニアリングプロジェクトマネジメント演習(2)

[Class requirement]

Fundamental skills about group leading and communication, scientific presentation.
We may restrict the class size to enhance students' learning.
Students who intend to join the course are required to attend the first class.

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

Report, presentations, class activity (at least 10 times attendance including mid-term and final presentations).

[Textbook]

Course materials will be provided if necessary.

[Reference books, etc.]

（Reference books）

Will be informed if necessary.

（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)]

Students are requested to prepare for group work, mid-term presentation and finel presentation.

（Others (office hour, etc.)）

We may restrict the class size to enhance students' learning.
Students who intend to join the course are required to attend the first class.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	安全衛生工学（4回コース） Safety and Health Engineering (4 times course)	Affiliated department, Job title,Name	Agency for Health, Safety and Environment Professor,HASHIMOTO SATOSHI Agency for Health, Safety and Environment Associate Professor,MATSUI YASUTO

Target year		Number of credits	0.5	Course offered year/period	2019/First semester

Day/period	Tue.4	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,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>	安全衛生工学（11回コース） Safety and Health Engineering (11 times course)	Affiliated department, Job title,Name	Agency for Health, Safety and Environment Professor,HASHIMOTO SATOSHI Agency for Health, Safety and Environment Associate Professor,MATSUI YASUTO

Target year		Number of credits	1.5	Course offered year/period	2019/First semester

Day/period	Tue.4	Class style	Lecture	Language	Japanese

[Outline and Purpose of the Course]

[Course Goals]

[Course Schedule and Contents]

,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,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.

Numbering code			
Course title <English>	JGP計算実習(CFD) Japan Gateway Project Computation Exercise(CFD)	Affiliated department, Job title,Name	Graduate School of Engineering Assistant Professor,TONOMURA OSAMU

Target year		Number of credits	0.5	Course offered year/period	2019/Intensive, First semester

Day/period	Intensive	Class style	Seminar	Language	Japanese

[Outline and Purpose of the Course]

Computational fluid dynamics (CFD) is utilized in various fields such as shape design and analysis of flow conditions inside devices. In this lecture and exercise, we will explain the fundamentals of CFD for microchemical devices, conduct exercises using CFD software, and acquire the current state of CFD simulation technology.

[Course Goals]

Students can build models for devices with various channel shapes and acquire skills that can simulate the flow conditions in three dimensional devices without reaction. Also, for systems with heat transfer and/or reaction, students will acquire skills that can model them on their own by referring to the manual.

[Course Schedule and Contents]

1. Lecture and exercise (1):
Fundamentals of CFD and its application to device design

2. Lecture and exercise (1):
Basics of operation of CFD software

3. Lecture and exercise (1):
Tutorial Exercise 1: Analysis of mixing characteristics in microdevices (2D)

4. Lecture and exercise (1):
Tutorial Exercise 1: Analysis of mixing characteristics in microdevices (3D)

[Class requirement]

It is desirable to have basic knowledge on modeling related to material balance.

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

Evaluation is based on the task in the lecture and the report.

Continue to JGP計算実習(CFD)(2)↓↓↓

JGP計算実習(CFD)(2)

[Textbook]

Materials created by faculty are distributed to students.

[Reference books, etc.]

（Reference books）

It will be introduced during the lecture.

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

We plan to rent a computer for a certain period of time. Students can pursue analysis and design tasks using the computer. This allows students to review CFD simulation techniques.

（Others (office hour, etc.)）

We may restrict the number of students taking into consideration the restrictions on available PCs and software and the effect of exercises.

*Please visit KULASIS to find out about office hours.

未更新

Numbering code			
Course title <English>	JGP計算実習(MO) Japan Gateway Project Computation Exercise(MO)	Affiliated department, Job title,Name	Graduate School of Engineering Professor,SATO HIROFUMI Center for the Promotion of Interdisciplinary Education and Research Program-Specific Associate Professor,FUKUDA RYOICHI

Target year		Number of credits	0.5	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]

,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.

Numbering code	G-LAS00 80001 LJ20		
Course title <English>	研究倫理・研究公正（理工系） Research Ethics and Integrity(Science and Technology)	Affiliated department, Job title,Name	Institute for Liberal Arts and Sciences Program-Specific Professor,ITO SHINZABUROU Institute for Liberal Arts and Sciences Program-Specific Professor,SATOU TOORU Graduate School of Engineering 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・ 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-LAS01 80001 LJ10		
Course title <English>	学術研究のための情報リテラシー基礎 Basics of Academic Information Literacy	Affiliated department, Job title,Name	Institute for Liberal Arts and Sciences Professor,KITA HAJIME Kyoto University Library Associate Professor,KITAMURA YUMI Academic Center for Computing and Media Studies Program-Specific Senior Lecturer,FLANAGAN, BrendanJohn Academic Center for Computing and Media Studies Professor,Ogata Hiroaki

Group	Common Graduate Courses	Field(Classification)	Computer Science and Information Technology
Language	Japanese	Old group	Number of credits: 0.5

Hours	7.5	Class style	Lecture	Course offered year/period	2019・ Intensive, First semester
Day/period	Intensive	Target year	Graduate students	Eligible students	For all majors

[Outline and Purpose of the Course]

本科目では大学院生として研究室などでの研究活動を本格化させるための基礎的な知識・スキルとして、大学図書館などを活用した学術情報の探索と発信、本学が提供する情報通信サービスの理解とその適正な運用、その基礎となる情報ネットワークやコンピュータについての実践的事項、情報セキュリティと情報倫理などを学習する。

[Course Goals]

大学図書館などを利用した学術目的の情報探索、情報発信について、効果的な文献の探索・収集・活用の手法と、論文として発表する際のマナーを知る。

研究活動でコンピュータや LAN、インターネットを適切に利用するための技術的な基礎知識を知る。

研究室でのネットワーク利用のために本学が提供しているKUINS 等の情報通信サービスについて知り、適切に利用できるようになる。

研究活動でコンピュータやネットワークを利用する際の本学での遵守事項や情報セキュリティ・情報倫理上の留意点を知り、実践できるようになる。

[Course Schedule and Contents)]

以下、４回の授業を集中講義形式で実施する。

・学術研究のための大学図書館利用と情報探索、情報発信(1回)
・ネットワークの基礎(1回)
・大学の情報基盤の利活用(１回)
・情報セキュリティと情報倫理（1回）

[Class requirement]

None

Continue to 学術研究のための情報リテラシー基礎(2)↓↓↓

学術研究のための情報リテラシー基礎(2)

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

授業への参加（課題の提出）により評価する。情報環境機構が提供する情報セキュリティ e-learning の修了は合格の要件である。

[Textbook]

プリント等を電子的に配布する。

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

情報セキュリティ e-learning についてはあらかじめ修了しておくこと。授業外学習として課題を課す。

[Others (office hour, etc.)]

受講時に、受講前に持っている情報リテラシーについての知識・スキル等を調査する予定である。授業資料は電子的に配布するので、ノートPC などを持参して受講することが望ましい。

Numbering code	G-LAS02 80001 SE48		
Course title <English>	大学院生のための英語プレゼンテーション Presentation for Graduate Students	Affiliated department, Job title,Name	Institute for Liberal Arts and Sciences Senior Lecturer,RYLANDER, John William
Group	Common Graduate Courses	Field(Classification)	Language and Communication
Language	English	Old group	Number of credits: 1
Hours: 15	Class style: Seminar	Course offered year/period	2019・ Intensive, First semester
Day/period	Intensive	Target year: Graduate students	Eligible students: For all majors

[Outline and Purpose of the Course]

This course is designed to provide graduate students with an opportunity to develop their ability and confidence when presenting field-specific content to an informed audience. Giving presentations in an academic setting, whether it is in a classroom, laboratory context, or at a conference, has become increasingly necessary for students at the graduate level. Course content extends from how to greet the audience to how to answer audience questions.

[Course Goals]

Students successfully completing this course will be able to do the following:

- Create an appropriate presentation slideshow for a conference or a research laboratory presentation;
- Clearly introduce and provide an overview of the talk through appropriate signposting;
- Properly display visual aids to enhance audience understanding of research data;
- Use posture and movement to engage the audience;
- Use gestures and gaze to emphasize information and connect with the audience;
- Produce a presentation; and
- Answer audience questions.

[Course Schedule and Contents)]

Session 1: Purpose and structure of academic presentations
Session 2: Topic selection and development
Session 3: Information organization: From greetings to goodbyes
Session 4: Creating effective slideshows and displaying research data
Session 5: Body language and gestures
Session 6: Answering audience questions
Session 7: A special focus on data significance
Session 8: Student presentations and instructor feedback

[Class requirement]

This course has a limit set on student enrollment. In the case where many students wish to enroll in class, a lottery system will decide inclusion.

Continue to 大学院生のための英語プレゼンテーション(2)↓↓↓

大学院生のための英語プレゼンテーション(2)

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

30% Active Participation
30% Slideshow Creation
40% Main and Minor Presentations

[Textbook]

Not used

[Reference book, etc.]

（Reference book）
All course materials will be provided to the students by the teacher.

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

Students will be asked to work on several smaller in-class talks and one larger presentation as their primary out-of-class homework assignment.

[Others (office hour, etc.)]