Outline of Energy Science and Engineering (2.0credits) (エネルギー理工学序論)

Course Type	Basic Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	1 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

It is aimed to gain pertinent interest in energy engineering through a survey on research and developments in the relevant field. It is also one of main aims to understands the curriculum of the department and its relation with the research presently carried out.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Introduction to Energy Science and Engineering (2.0credits) (エネルギー理工学概論)

Course Type	Basic Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	2 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

The aim of this lecture is to show the outline of the Department of energy science and engineering througth the introductory talk on the current research topics and visit to the laboratories in the department.

●Prerequisite Subjects

●Course Topics

General review about the energy science and engineering, introductory talk and discussion on the current research topics in the department, visit to the laboratories.

●Textbook

●Additional Reading

●Grade Assessment

Class attendance and reports (60% to pass)

●Notes

No special prerequisite for taking this class.

●Contacting Faculty

Design and Practice in Energy Science and Engineering (3.0credits) (エネルギー理工学設計及び製作)

Course Type	Basic Specialized Courses	
Class Format	Lecture and Exercise	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Yoshiyuki TSUJI Professor	Part-time Faculty

●Course Purpose

In this class, students must acquire the following knowledge and abilities at the end of the class.To be a goal.(1) Represent (draw) shapes (dots, lines, faces, and solids) in three-dimensional space on a two-dimensional plane(2) By dealing with various problems of quantitatively and geometrically analyzing 3D figures from diagrams expressed oppositely, it has the ability to grasp and express spatial figure information.The purpose of this lecture is to understand and learn the basics of representation and geometric analysis methods in three-dimensional space during lecture time or through actual drawing exercises as a subject.Use CAD software to get drawings.

●Prerequisite Subjects

mathematic, physics

●Course Topics

After explaining the following contents in the lecture, the drawing is carried out using CAD software. 1 Introduction, drawing 2 Basics of projection and orthographic projection (1) 3 Basics of projection and orthographic projection (2) 4 Understanding shapes by projection (1) 5 Understanding shapes by projection (2) 6 Understanding shapes by projection (3) 7 Understanding shapes by projection (4) 8 Polyhedron and cross-sectional (1) 9 Polyhedron and cross-sectional (2) 10 Polyhedron and cross-sectional (3) 11 Curved and curved (1) 12 Curved and curved (2) 13 Shadows (1) 14 Shadows (2) 15 ConclusionRead the designated textbook "Introduction to SOLID WORKS" or handout (Chapter 1) in advance. Be familiar with the meaning of the technical terms by pre-training the scope of the next class.In parallel with CAD software, material strength calculation and thermal fluid calculation are performed to understand and control the operating principle of stepper motors.

●Textbook

Introduction to SOLID WORKSHowever, the required items should be printed.

●Additional Reading

SOLID WORKS Practice Book Adrise Nikkan Kogyo Shimbun

●Grade Assessment

Examination and exercise reports according to the content of the class (about 80% of grades) and attendance (about 20%) rate out of 100. If the assignment report is properly submitted and the drawing method is understood, it will be passed, and it will be reflected in the results according to the content and attendance of the report.

●Notes

●Contacting Faculty

Faculty Contact:y-tsuji@energy.nagoya-u.ac.jp (don't forget to allow receiving when sending emails) (Questions and consultations will be accepted at any time during the drawing exercise time, so please raise your hand.)

Data Statistics Analysis (2.0credits) (データ統計解析Ａ)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	1 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Atsushi OKAMOTO Associate Professor

●Course Purpose

The purpose of this course is to learn the basic of statistics. We will master the error handling, the probability distributions, the characteristics of sample data, and the regression. Those topics are essential bases for the following courses on mathematics, physics, chemistry, and experiment.

●Prerequisite Subjects

Math, Physics, Chemistry

●Course Topics

The presentation of physical quantities with their inaccuracies
Error propagation
Probability distributions (binomial-, Poisson-, normal distributions and the central limit theorem)
The average and the mean squared deviation of a data series
Estimates for mean and variance
Graphical handling of data with error
Fitting functions to data (linear regression, the chi-squared test)
Exercises

●Textbook

Herman J.C. Berendsen, "A Student's Guide to Data and Error Analysis", Cambridge University Press
ISBN 978-0-521-11940-5(hardback) or 978-0-521-13492-7(paper back)

●Additional Reading

E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, Inc.

●Grade Assessment

Exercises and Examination

●Notes

●Contacting Faculty

Please ask in class.

Outline of Electrical and Electronics Engineering (2.0credits) (電気電子工学通論)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Akira URITANI Professor

●Course Purpose

You will learn the fundamental analysis method of electrical and electronic circuits and transient phenomena using Laplace transform.You will learn about transfer functions, frequency characteristics of circuitsas applications, and semiconductor elements that are important in electroniccircuits (Diodes, transistors, FETs, operational amplifiers, etc.).By learning these, You will understand the basics of signal processing for transient events such as radiation measurement.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Quantum Mechanics A (2.0credits) (量子力学Ａ)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	1 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Michihiro SHIBATA Professor

●Course Purpose

Understanding the microscopic phenomena on an atomic scale which cannot be understood in the framework of classical physics and also physics in the knowledge in high schools. The history on development of quantum physics is presented.
In the background of classical dynamics, mathematics and chemistry, the aim of this lecture is to put on basic skills of the quantum theory by acquiring as well as keep the application ability which sees into theory from an experimental result. and is to confirm the basic skills and plow application ability through this lecture.
Specifically, the goal of study are following:
1. Understanding of physical logic that derives laws from experimental facts.
2. Understanding of specific heat and black-body radiation on the basis of the concept of quantum physics.
3. Understanding of atomic structure and optical spectra.
Through the above learning, basic skills to learn the modern quantum physics is acquired.

●Prerequisite Subjects

Mechanics, Electromagnetics, Mathematics, Chemistry

●Course Topics

1. Introduction to atomic physics
2. Theory of specific heat and law of equipartition of energy
3. Black body radiation
3-1. Stefan-Boltzmann low, Wien's displacement law, Rayleigh-Jeans' and Wien's formula of radiation
3-2. Planck's formula of radiation
4. Particle behavior of light
Photoelectric effects and Compton scattering
5. Wave behavior of particles and de Broglie wave
6. Structure of atom
6-1. Identification of atomic nuclei by Rutherford scattering
6-2. Elucidation of atomic structure by atomic spectra
6-3. Elucidation of structure of hydrogen atom by Bohr's theory
7. Atomic structure and energy of characteristic X-ray
8. Introduction to quantum mechanics
Read a relevant part of the material and the textbook distributed beforehand.

●Textbook

Atomic Physics by K. Kikuchi

●Additional Reading

Quantum Mechanics I by S. Tomonaga
Atomic Physics I, II by E. Shpolsky
Introduction to Quantum Mechanics by K. Takada

●Grade Assessment

Examination and Report and/or short tests.

●Notes

No registration conditions required

●Contacting Faculty

in class or office
ex.2569
e-mail:i45329a@nucc.cc.nagoya-u.ac.jp

Physical Chemistry (2.0credits) (物理化学)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	1 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Kayo SAWADA Associate Professor

●Course Purpose

Several topics, which are not treated in Fundamental Chemistry I and II, of the fundamentals of the Physical Chemistry are lectured in the present class. The topics are chemical kinetics, the theories of ionic equilibrium in aqueous solutions, and, the equilibrium aspects of the electrochemistry.

Students are expected to obtain the following abilities.
(1) To explain the chemical reactions concerning materials sciences on the basis of fundamental reaction kinetics
(2) To understand the equilibrium aspects of acid-base reactions in water solutions
(3) To understand the equilibrium aspects of red-ox reactions in the electrochemical reaction systems

●Prerequisite Subjects

Chemistry I and II

●Course Topics

1. Reaction rate: Topic 6 of the textbook
We learn the definition of reaction rate, its temperature dependence, rate equations for various reactions, and reaction mechanism.
2. Solution chemistry and electrochemistry: Topics 4 and 5 of the textbook
We learn properties of mixture and acid-base reactions etc. as basic solution chemistry, and chemical cell and the standard potential etc. as fundamental topics of electrochemistry.

Solve the end-of-chapter problem for each topic.

●Textbook

P. Atkins and J. de Paula, Elements of Physical Chemistry, 7th ed., (Japanese translation pub. by Tokyo Kagaku Dojin)

●Additional Reading

H. Nomura, H. Kawaizumi et al., Rikokei Gakusei no tame no Kagaku Kiso, 7th ed., Gakujutsu Tosho Shuppan-sha Co., Ltd.
H. Kawaizumi, Enshu de Nattoku!! Rikokei Gakusei no tame no Kagaku Kiso, 2nd ed., Gakujutsu Tosho Shuppan-sha Co., Ltd.

●Grade Assessment

Grades are evaluated by Written Examination, and students who earn 60 % or more points are credited.

●Notes

This class assumes an understanding of chemistry, physics and mathematics, basic calculus and exponential calculation, taught in high school.

●Contacting Faculty

Contact to the following addresses

Assoc. Prof. Sawada k-sawada@energy.nagoya-u.ac.jp

Computer programing and numerical calculation　A (1.0credits) (プログラミング法および数値計算演習Ａ)

Course Type	Basic Specialized Courses
Class Format	Lecture and Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	1 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Hideki TOMITA Associate Professor

●Course Purpose

The purpose of this course is to provide basic computer literacy skills and basic ideas of computer programming. The course starts with an introductory part including a practice of PC usage intended for beginners. In the latter half of the term, students are supposed to become able to make a program in the C language by themselves through exercises.

●Prerequisite Subjects

High School Mathematics

●Course Topics

1. Computer basics and numerical calculation
2. Introduction to program language C, Instruction of editor and compiler
3. Fundamental grammar of C (Syntax, Data types, Operators, Selection statements, Iteration statements, Arrays, Functions, File input/output)

Practice of c programming (creating the source code, compiling, program development)

●Textbook

Programming in C 1st step (2nd edition), Satoshi Uchida (Supervision), Research Institute of Systems Planning, Inc.(edit), Ohm, 2001.
ISBN: 978-4-274-06440-1
url: https://www.ohmsha.co.jp/book/9784274064401/

●Additional Reading

Introduce in the class

●Grade Assessment

Grades will be based on several project reports and examinations.
Students must obtain a grade C or higher to pass the course.

(For students of Year 2020 entrance and later)
100-95:A+, 94-80:A, 79-70:B, 69-65:C, 64-60:C-, <59:F
(For students of Year 2019 entrance and earlier)
100-90:S, 89-80:A, 79-70:B, 69-60:C, <59:F
Grades: S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

None

Please check the NUCT site of this course.

●Contacting Faculty

Face-to-face discussions after class or exchanging e-mails.
Contact address: h-tomita(at)energy.nagoya-u.ac.jp
(Please replace (at) with @.)

Computer programing and numerical calculation　B (1.0credits) (プログラミング法および数値計算演習Ｂ)

Course Type	Basic Specialized Courses
Class Format	Lecture and Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Sachiko YOSHIHASHI Associate Professor

●Course Purpose

This lecture gives analytical method knowledge to understand phenomena represented by mathematical models.In addition, programing skills using C language as an analysis method can be improved.

●Prerequisite Subjects

Programming method and numerical calculation A, Mathematics 1 with Exercises, Data statistical analysis

●Course Topics

Error and uncertainty
Newton method
Gaussian elimination
Finite difference method
Euler method
Runge-Kutta method

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Please ask in class.

Mathematics I and Tutorial (3.0credits) (数学１及び演習)

Course Type	Basic Specialized Courses
Class Format	Lecture and Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	"YAMAMOTO Akio" Professor

●Course Purpose

Based on mathematics and physics in 1st grade education, acquire the advanced contents of mathematics necessary to acquire specialized subjects in the Faculty of Engineering. In this lecture, we will focus on ordinary differential equation theory and vector analysis, and aim to acquire basic skills and cultivate applied skills that can be applied to engineering.

The objective of this lecture is to ensure that participants have the following knowledge and skills at the end of the class.
(1) To understand the concept of some differential equations required in the engineering field.
(2) Apply and solve some differential equations required in engineering fields to specific problems.
(3) Understand the basic concept of vector field.
(4) Understand vector field calculations and solve basic problems.

●Prerequisite Subjects

(Basic courses in Natural Sciences) Linear algebra I and II, Calculus I and II.

and aslo related to:
(Basic courses in Natural Sciences) Dynamics I and II, and Electromagnetism I and II.
(Specialized Courses) Mathematics II and Tutorial, and Mathematics III and Tutorial.

●Course Topics

The students acquire following contents:

Ordinary Differential Equations (ODEs)
1. First-Order ODEs
2. Second-Order Linear ODEs, Higher Order Linear ODEs
3. Systems of ODEs

Vector Calculus
1. Vector Differential Calculus. Grad, Div, Curl (Rot)
2. Vector Integral Calculs. Integral Theorems

In two lecture units (90 + 90 = 180 minutes), lectures and exercises are repeated. Before each lecture, prepare for the lesson by reading the textbook about the place where the lecture is conducted. Submit the answers to all the questions taken up in the exercise as a report each time.

●Textbook

Haruaki Tasaki, Mathematics, 2020/3
Chap.5 and 10
https://www.gakushuin.ac.jp/~881791/mathbook/MB20200315.pdf

●Additional Reading

References will be introduced as needed.

●Grade Assessment

Evaluate the level of the achievement target by each exercise report (50%) and final exam (50%). Pass if it can solve basic problems about ordinary differential equations and vector analysis. If you can handle more difficult questions, reflect them in your grades.

●Notes

None

●Contacting Faculty

Questions will be accepted during breaks after lectures or at any time. In the latter case, make an appointment in advance.

Mathematics II and Tutorial (3.0credits) (数学２及び演習)

Course Type	Basic Specialized Courses	
Class Format	Lecture and Exercise	
Course Name	Department of Energy Science and Engineering	
Starts 1	2 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Atsushi OKAMOTO Associate Professor	Sachiko YOSHIHASHI Associate Professor

●Course Purpose

This lecture gives mathematical knowledge to understand physical phenomena appearing in the engineering field.

●Prerequisite Subjects

Mathematics 1 with Exercises

●Course Topics

Laplace transformation, Fourier transformation, Fourier expansion, partial differential equation

●Textbook

E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, Inc.

●Additional Reading

Murray R. Spiegel, "Theory and Problems of Fourier Analysis with Applications to Boundary Value Problems", Schaum's Outline Series, McGraw-Hill, Inc.

●Grade Assessment

Exercises + Examination

●Notes

●Contacting Faculty

Please ask in class.

Mathematics III and Tutorial (3.0credits) (数学３及び演習)

Course Type	Basic Specialized Courses	
Class Format	Lecture and Exercise	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	Masato NAKAYA Associate Professor	Yasuaki KOJIMA Associate Professor

●Course Purpose

Mathematical analysis on the basis of theory of complex function is fundamentally important and useful for science and engineering. This course is composed of "Lecture" and "Exercises" parts. In the lecture, we will learn fundamental theory of complex function. In the exercises part, we will carry out exercises provided in the text book.

●Prerequisite Subjects

Mathematics-I/exercise, Mathematics-/exercise, electrodynamics, mechanics, and fluid dynamics

●Course Topics

1. Introduction: Applications of mathematics on physics and engineering 2. Complex numbers and analytic functions 3. Derivatives and integrals of analytic functions 4. Taylor and Laurent series and singularities 5. Analytic continuation 6. Calculus of residues 7. Conformal mapping 8. Applications of complex functions on electromagnetism, quantum mechanics and fluid dynamicsExercise problems related to the contents explained in the lecture are assigned every timeEach student should solve them after class hours. The status of the efforts will be confirmed by quiz next week. In addition, ask the representative to explain the exercise problems.

●Textbook

Advanced Engineering Mathematics (by Erwin Kreyszig)In addition, Handouts will be provided in each lecture.

●Additional Reading

The Theory of Functions (by E. C. Titchmarsh)

●Grade Assessment

Grades will be evaluated by discussion in lectures, exercise, report, and examination.

●Notes

It is desirable that students have already earned credits for Mathematics-I/exercise and Mathematics-/exercise.

●Contacting Faculty

(Nakaya, M.)Office: Building No.9 (west wing), Room 419,Tel: 052-789-3785,E-mail: m-nakaya[at]energy.nagoya-u.ac.jp(Kojima, Y.)Office: Radioisotope Research Center, Room 218Tel: 052-789-2572,E-mail: y-kojima[at]energy.nagoya-u.ac.jp

Introduction to Nuclear Physics (2.0credits) (原子核物理概論)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Yasuaki KOJIMA Associate Professor

●Course Purpose

This lecture covers nuclear fundamental properties, nuclear disintegration (or decay), radioactivity, stability of nuclei, nuclear structure, nuclear reaction and particle accelerator.
Aims:
1. Be able to understand explain nuclear properties such as radioactivity, decay, binding energy, etc.
2. Be able to perform basic nuclear calculations such as reaction energies.
3. Be able to understand and explain experimental technique to measure nuclear properties.

●Prerequisite Subjects

Mechanics I, Mechanics II, Electromagnetics I, Quantum Mechanics A

●Course Topics

1. Radioactivity
2. Properties of atomic nuclei such as mass, binding energy, radius etc.
3. Alpha-decay, Beta-decay, Gamma-transition, internal conversion and fission
4. Nuclear model and magic number
5. Nuclear reactions

Exercises related to the contents of each lecture will be presented. Submit them as a report.

●Textbook

Textbooks are not specified, but lecture materials are distributed in each class.

●Additional Reading

Introduction to Nuclear Physics (in Japanese), author: Y. Sumi, published by SYOKABO.
Nuclear Physics (in Japanese), author: KAGEYAMA Seizaburo, published by ASAKURA-Syoten.
Nuclear Physics (in Japanese) by K. Yagi, ASAKURA-syoten.
Nuclear Physics (in Japanese) by T. Nagae and S. Nagamiya, SYOKABO.

●Grade Assessment

Grades will be evaluated by reports, midterm exams and final exams.
To pass, you must be able to explain basic properties of nucleus, and perform basic calculations on nuclear energies. If the more difficult problems can be handled, the grade is reflected accordingly.

●Notes

●Contacting Faculty

mail: y-kojima@energy.nagoya-u.ac.jp
tel: 052-789-2572
Radioisotope Research Center, room number 218

Seminar in Applied mechanics (1.0credits) (応用力学演習)

Course Type	Basic Specialized Courses
Class Format	Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Michihiro SHIBATA Professor

●Course Purpose

The object of this course mainly to do practice of the movement of a particle and a rigid body as the important basic field in present-day science and technology based on a lecture of dynamics 1 and 2. The aim is to confirm the basic skills and plow application ability through this lecture. The following thing are studied through this lecture.1. solve a motion equation about movement of a particle under gravitational filed and a center force field.2. understand coordinate systems and change the coordinate system properly.3. understand momentum conservation law and energy conservation law and apply it to a problem.4. understand and explain the center-of-mass motion of two body problem.5. understand and explain the small oscillation in the balance point.6. understand the moment of inertia of the rigid body and make a motion equation about the typical shape.7. understand about small oscillation of a rigid body.

●Prerequisite Subjects

mechanics 1,2, mathematics

●Course Topics

1. Basic concepts:dimension, vector, Newton's laws of motion2. mathematical basic3. motion of point mass4. Conservative force and potential5. harmonic oscillation6. Universal gravitation7. Coordinate change, inertia force, centrifugal force, rotating coordinate and Coriolis force8. Two body problem and the center of gravity9. Center force field, moment of a force, the angular moment and angular moment conservation law10. Movement of a rigid body and the moment of inertiaSolve the practice problem that it was designated beforehand.

●Textbook

RIKIGAKU by Abe, R.

●Additional Reading

introduce according to the progress of a lecture.

●Grade Assessment

Evaluated by solution in class and reports and/or short tests

●Notes

No registration conditions required

●Contacting Faculty

in class or officeex.:2569e-mail:i45329a@nucc.cc.nagoya-u.ac.jp

Seminar in Thermodynamics (1.0credits) (熱力学演習)

Course Type	Basic Specialized Courses
Class Format	Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Youichi ENOKIDA Professor

●Course Purpose

This lecture helps students develop an intuitive understanding thermodynamics by emphasizing chemical thermodynamics already learned and practical argumentsin order to reach at the educational goal of the Department of Energy Science and Engineering. The class covers the basic principles of thermodynamics learned in the Institute of Liberal Arts and Sciences while presenting real-world engineering examples so students get a feel for how thermodynamics is applied in engineering practices. The exercise lessons in the class explore the various facets of thermodynamics through careful use of numerous practical examples, having students develop necessary skills to bridge the gap between basic knowledge and the confidence to properly apply their knowledge as the final goal of this class. The following knowledge and skills are expected to master in the class;1)The students can solve quantitatively problems related to the first law of thermodynamics,2) the students can solve quantitatively problems related to the second law of thermodynamics,3) the students can evaluate thermochemic conditions at a given pressure equiliblium,4) the students can evaluate thermochemic conditions at a given electrochemical equilibrium, 5) the students can evaluate weight fraction of each component in a every phase at a given equilibrium state related to the two-component-phase diagram,6) the students can model a real world thermal electric power station as a thermodynamic process system and evaluate its thermal efficiency,7) the students can draw a thermal cycle model for a gas turbin process and explain p-V and S-T diagrams for it,8) the students can evaluate some thermodynamic values for chemical incineration processes,9) the students can evaluate extent of chemacal reaction at a given thermodynamic condition,10) the students can draw a phase diagram for a pure sabstance so as to take account of Clausius–Clapeyron equation.11) the students can explain the difference between real gas and ideal gas based on an example of equation of the state for real gas,12)the students can evaluate a coefficient of performance for a given refrigerating cycle,13) the students can explain fundamental thermodynamic cycle of industrial steam cycle with saturated vapor and evaluate some thermodynamic feature such as dryness.14) the students can solve some review excercises in a limited time, and15) the students confirms by themselves if they can solve actual problems given at the past entrance exams for the Departments of Energy Engineering in Graduate School.

●Prerequisite Subjects

Fundamental Chemistry II lectured in the Institute of Liberal Arts and Sciences.

●Course Topics

This lecture helps students develop an intuitive understanding thermodynamics by emphasizing chemical thermodynamics and practical arguments. The lecture covers the basic principles of thermodynamics learned in the Institute of Liberal Arts and Sciences while presenting real-world engineering examples so students get a feel for how thermodynamics is applied in engineering practice. The exercise lessonsin distributed resumes based upon the textbooks explore the various facets of thermodynamics through careful use of numerous practical examples, having students develop necessary skills including presentation to bridge the gap between knowledge and the confidence to properly apply their knowledge.

●Textbook

1) F. Kawaizumi, et al.,"Fundamental Chemistry for Students in Science and Engineering Schools, (2013) in Japanese.2) Japan Society for Mechanical Engineers, Problems in Thermodynamics, JSME,Maruzen Publishing (2012) in Japanese.3) Yunus A. Cengel, Michael A. Boles, "Thermodynamics (in SI Units): An Engineering Approach," McGraw-Hill Education (2014). The textbooks 1) and 2) are mandatory in this

class, the students should have them by, for example, purchasing in a university book store. One may read the textbook 3) in university library.

●Additional Reading

Resumes on the practices necessary for each class would be distributed every week.

●Grade Assessment

Attendance and submission for Problem solving; 30%,Reporting 10%,Final Exam 60%.Evaluation of the final result, grading concerning with the class will follow the standard in School of Engineering prior announced. The criteria to pass the class accords with the ability to solve practices given in the class. The better grade will be given to a student who can solve higher level problems as appear in the entrance exam for the Graduate School.

●Notes

No special request/ condition, but attendance at every class is mandatory as well as keeping deadline strictly for submission of reports.[About the class in 2021]Due to countermeasure against COVID-19, lectures in the current clas will be given as distance learning, in principal, online or on-demand basis by an assist of NUCT, where MS power point files or youtube videos are provided, you should download the specified files and watch prior to each class. The preparation and review should be performed on NUCT's quizz or reporting features.

●Contacting Faculty

Please feel free to inquire on the lecture and problem solving by voice phone or e-mail in English or in Japanese, as follows;By phone; 052(789)5937 during office hours from 7:30 through 16:00,By e-mail; yenokida@nagoya-u.jp.

Seminar in Applied Electromagnetics (1.0credits) (応用電磁気学演習)

Course Type	Basic Specialized Courses
Class Format	Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	TakaakiFUJITA Professor

●Course Purpose

Based on the Electromagnetics I and Electromagnetics II, solve problems on elecromagnetics.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Fluid Mechanics with Exercises (3.0credits) (流体力学及び演習)

Course Type	Basic Specialized Courses
Class Format	Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Compulsory
Lecturer	Yoshiyuki TSUJI Professor

●Course Purpose

Learn the basics of fluids and flow dynamics. The purpose of this course is to estimate the energy conservation and loss of concrete flow fields, and to obtain basic knowledge for analyzing engineering problems necessary in the field of physical engineering, especially quantum energy engineering. Goals 1. Acquisition of basics on the properties of fluids 2. Acquisition and application of fluid energy preservation rules 3. Understanding the characteristics of specific flow fields

●Prerequisite Subjects

mechanics I, mechanics II, mathematics, electromagnetism I

●Course Topics

1. Properties of units and fluids 2.Hydrodynamics 3.Fundamentals of flow 4.Measurement of flow rate and flow rate 5.Flow and loss of pipes 6.Law of fluid momentum and law of angular momentumDistribute lecture materials in advance. As a reference book,Read "Engineering Fluid Dynamics" (Kyoryo Publishing), "Turbulent Dynamics" (Asakura Shoten) and "Fluid Dynamics" (Asakura Shoten) in advance.To advance the scope of the next class and to understand the meaning of technical terms, etc.

●Textbook

Introduce as appropriate as the lecture progresses. In addition, lecture materials will be distributed.

●Additional Reading

"Engineering Fluid Dynamics" by Nakamura Nozoi, Kyoryo Publishing"Fluid Dynamics" by Mikio Hino, Asakura Shoten"Turbulent Dynamics" by Shigeo Takada, Asakura Shoten

●Grade Assessment

Attendance (20%)Each small test (30%)Final exam (50%)At the above rate, determine whether the purpose of the lecture has been achieved, and pass an achievement of 60%.

●Notes

●Contacting Faculty

Faculty Contact:y-tsuji@energy.nagoya-u.ac.jp (Don't forget to accept permission when sending emails)

Quantum Mechanics B (2.0credits) (量子力学Ｂ)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Shinya YAGI Professor

●Course Purpose

Basic concepts and principles of quantum mechanics necessary for the modern science and technology are lectured.

●Prerequisite Subjects

Quantum mechanics A, Electromagnetism, Statistical mechanics

●Course Topics

1.Basic principles of quantum mechanics-A
2.Heisenberg's uncertainty
3.Schroedinger Eq.
4.Wave function
5.Square-well potential
6.Electron orbits in an atom
7.Structure of hydrogen-like atom
8.Tunnel effect
9.Perturbation
10.Summary and evaluation

●Textbook

Quantum Mechanics, Yasuo Hara Iwanami-Shoten)

●Additional Reading

Quantum Mechanics, Stephan Gasiorowicz
Quantum Mechanics, Schiff
Quantum Physics,Berkeley physics course vol.4
Quantum Mechanics, Y.Hara(Japanese)
Quantum Mechanics of Matter, M.Okazaki(Japanese)

●Grade Assessment

Examination(80%) and Report(20%), Minimum mark for credit: 60/100

●Notes

nothing

●Contacting Faculty

e-mail: yagi.shinya@c.mbox.nagoya-u.ac.jp
Phone: 052-747-6828

Seminar in Quantum Mechanics (1.0credits) (量子力学演習)

Course Type	Basic Specialized Courses
Class Format	Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Junji YUHARA Associate Professor

●Course Purpose

This course deals with the basic concepts and principles of quantum dynamics.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Statistical Mechanics (2.0credits) (統計力学)

Course Type	Basic Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Hiromi YAMAZAWA Professor

●Course Purpose

The purpose of this lecture is to gain comprehensive understanding of statistical mechanics by learning its basic concepts and their applications to physical phenomena. Starting from the basic concepts and formalism of dynamics and quantum mechanics, fundamental concepts of statistical mechanics, such as the canonical distribution, Fermi distribution, partition function and density of states, will be discussed.

●Prerequisite Subjects

Data statistical analysis A, Dynamics I, Dynamics II, Thermodynamics Exercise

●Course Topics

1. Probability density and statistics of physical quantities2. Ensemble average and micro-canonical distribution3. Temperature and entropy4. Canonical distribution5. Grand canonical distribution6. Quantum statistical mechanics7. Fermi distribution and Bose-Einstein distribution

●Textbook

●Additional Reading

●Grade Assessment

Examination (midterm 30%, final 70%)

●Notes

●Contacting Faculty

Contact after the lecture

Seminar in Statistical Mechanics (1.0credits) (統計力学演習)

Course Type	Basic Specialized Courses
Class Format	Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	TomoakiYAMADA Associate Professor

●Course Purpose

The aim of this course is to help students acquire an advanced understanding of statistical mechanics through the exercises. Starting from the exercises on basic concepts and formalism of dynamics and quantum mechanics, the problems in statistical mechanics, such as the canonical distribution, Fermi distribution, partition function and density of states, will be worked out.

The goals of this course are to
1) be able to solve the problems in temperature, entropy and specific heat,
2) be able to solve the problems in canonical distribution,
3) be able to solve the problems in Fermi and Bose distribution functions.

●Prerequisite Subjects

Statistical data analysis A, Mechanics I, II, Seminar in thermodynamics, Statistical mechanics

●Course Topics

Exercises on the following problems:
1. Probability density and statistics of physical quantities
2. Ensemble average and microcanonical ensemble
3. Temperature and entropy
4. Canonical distribution
5. Grand canonical distribution
6. Quantum statistical mechanics
7. Fermi distribution and Bose-Einstein distribution

The students are expected to prepare each lecture by reading the corresponding chapter in the textbook.

●Textbook

Japanese textbook on statistical mechanics written by Masao Doi (ISBN-13: 978-4254137422).

●Additional Reading

References will be introduced in the class according to need.

●Grade Assessment

Evaluation is based on the performance of exercises and the commitment to the course. Minimum requirement to obtain the credit is to be able to solve the basic problems in statistical mechanics.

●Notes

This course will be taught in Japanese. The students are required to take the course of Statistical Mechanics (11066).

●Contacting Faculty

After lectures. Otherwise, contact by phone (4689) or Email (t-yamada@energy.nagoya-u.ac.jp).

Transport Phenomena with Exsercises (3.0credits) (移動現象論及び演習)

Course Type	Basic Specialized Courses
Class Format	Lecture and Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Compulsory
Lecturer	Takahiko SUGIYAMA Associate Professor

●Course Purpose

The aim of this course is to help students acquire the fundamental knowledge of transport phenomena on momentum, heat and mass.

The goals of this course are to
1. Obtain basic knowledge of transport phenomena
2. Learn how to establish the equations and how to solve them
3. Understand physical consideration

●Prerequisite Subjects

Mathematics 1 and exercise
Mathematics 2 and exercise
Fluid Mechanics with Exercises

●Course Topics

1. Introduction
2. Transport of momentum
3. Transport of energy
4. Transport of mass
5. Fundamental equations of transport phenomena
6. Transport phenomena in turbulent flow

Please get the lecture note from NUCT system and have a read before the class. Please challenge to examples and end-of-chapter problems in the textbook after the class and cultivate your applied skill.

●Textbook

Transport Phenomena; R. B. Bird et al. (WILEY)
ISBN: 0-471-36474-6

●Additional Reading

According to the progress of lecture and exercise, books and references will be introduced.

●Grade Assessment

Your overall grade in the class will be decided based on the following:

Class attendance and attitude in class: 10%
Short reports: 20%
Term-end examination: 70%

To pass, students must earn at least 60 points out of 100.
(100-80: A, 79-70: B, 69-60: C, 59-: F, Some of excellent: S)

●Notes

None.

●Contacting Faculty

Please feel free to inquire on the lecture by voice phone or e-mail in English or in Japanese, as follows

Phone : 052(789)3786
E-mail: sugiyama@energy.nagoya-u.ac.jp

Experiment of Energy Engineering 1 (1.0credits) (エネルギー理工学実験第１)

Course Type	Basic Specialized Courses	
Class Format	Experiment	
Course Name	Department of Energy Science and Engineering	
Starts 1	2 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

Through the fundamental works on physics and chemistry, the program offers knowledge and skills on usage of experimental instruments, data analysis and preparation of report, which will be an introduction to Advanced Works in Energy science and engineering 2A and 2B in the next year.

●Prerequisite Subjects

Experiments of physics and chemistry

●Course Topics

Following a lecture on safely, students are to be divided into four groups and to carry out the following four works in a half-year term. Submission of reports including results of experiments, data analysis and discussions is obligatory.

●Textbook

Manual for Advanced Work in Energy Science and Engineering 1. The text book will be distributed at a cost in the first lecture on safely.

●Additional Reading

none

●Grade Assessment

report and oral examination minimum mark for credit: 60/100

●Notes

●Contacting Faculty

Experiment of Energy Engineering 2A (2.0credits) (エネルギー理工学実験第２Ａ)

Course Type	Basic Specialized Courses	
Class Format	Experiment	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

Through the following advanced works, the program offers knowledge and skills needed to carry out researches in energy science and engineering. Students are requested to acquire knowledge and experimental skills.

●Prerequisite Subjects

Advanced work of energy science and engineering 1

●Course Topics

Following a lecture on safe usage of ionizing radiation, students are to be divided into six groups and to carry out three out of the six works in a half-year term. Submission of reports including results of experiments, data analysis and discussions is obligatory.

●Textbook

Manual for Advanced Work in Energy Science and Engineering 2:The text book will be distributed at a cost in the first lecture on safely.

●Additional Reading

●Grade Assessment

report and oral examination minimum mark for credit: 60/100

●Notes

●Contacting Faculty

Experiment of Energy Engineering 2B (2.0credits) (エネルギー理工学実験第２Ｂ)

Course Type	Basic Specialized Courses	
Class Format	Experiment	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Spring and Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

Through the following advanced works, the program offers knowledge and skills needed to carry out researches in energy science and engineering. Students are requested to acquire knowledge and experimental skills.

●Prerequisite Subjects

Advanced work of energy science and engineering 1

●Course Topics

Following a lecture on safe usage of ionizing radiation, students are to be divided into six groups and to carry out three out of the six works in a half-year term. Submission of reports including results of experiments, data analysis and discussions is obligatory.

●Textbook

Manual for Advanced Work in Energy Science and Engineering 2:The text book will be distributed at a cost in the first lecture on safely.

●Additional Reading

●Grade Assessment

report and oral examination minimum mark for credit: 60/100

●Notes

●Contacting Faculty

Seminar in Energy Engineering A (1.0credits) (エネルギー理工学セミナーA)

Course Type	Basic Specialized Courses	
Class Format	Seminar	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

The aim is to learn the fundamental knowledge and status of recent researches ina few research groups in the department, which form the basis of his/her own research and study in the future.Each student would reach at the goal after completing the class; Obtaining the knowledge and abilitty to explain fundamentals (concept, theory, important experimental facts, mechanisms), which are basics of the scientific field in the department; andObtaining ability to explain the student's own research issue in the recent advancesin the field.

●Prerequisite Subjects

All fundamental classes opened at the department of Energy Science and Engineering, School of Engineering. Several classes of the most important subjects may be specified by the professors in the doup work.

●Course Topics

Through a group work, appreciation of textbook or a peace of scientific publication in English language is trained as well as obtaining the knowledge on the related scientific fields. In general, group works include the folowing contents as examples;1) By self-learning on the specified part of the publication, a student should understand the contexts and summerize them in a document..2) By presentation in a group work and join Q and A and discussion.3) By reflecting the discussion, a student prepare the final report or oral presentation in English or Japanese, which would be specified by lecturers in each group.

●Textbook

Textbooks or equivalentreferences will be introduced in the research laboratory through NUCT or directly.

●Additional Reading

References or equivalent scientific papers will be introduced in the research laboratory through NUCT or directly.

●Grade Assessment

Based on attendance to the seminar and presentations and discussions during the seminar. Minimum mark for the credit is 60%.

●Notes

Because group works are required in this class, each student should attend at the specified research laboratory, which is informed before the first class through NUCTor the other means.

●Contacting Faculty

Question or inquery in each class is recommended, but after the class question by the students will be answered through NUCT or directly.

Seminar in Energy Engineering B (1.0credits) (エネルギー理工学セミナーB)

Course Type	Basic Specialized Courses	
Class Format	Seminar	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

The aim is to learn the fundamental knowledge and status of recent researches ina few research groups in the department, which form the basis of his/her own research and study in the future.Each student would reach at the goal after completing the class; Obtaining the knowledge and abilitty to explain fundamentals (concept, theory, important experimental facts, mechanisms), which are basics of the scientific field in the department; andObtaining ability to explain the student's own research issue in the recent advancesin the field.

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Through a group work, appreciation of textbook or a peace of scientific publication in English language is trained as well as obtaining the knowledge on the related scientific fields. In general, group works include the folowing contents as examples;1) By self-learning on the specified part of the publication, a student should understand the contexts and summerize them in a document..2) By presentation in a group work and join Q and A and discussion.3) By reflecting the discussion, a student prepare the final report or oral presentation in English or Japanese, which would be specified by lecturers in each group.

●Textbook

Textbooks or equivalentreferences will be introduced in the research laboratory through NUCT or directly.

●Additional Reading

References or equivalent scientific papers will be introduced in the research laboratory through NUCT or directly.

●Grade Assessment

Based on attendance to the seminar and presentations and discussions during the seminar. Minimum mark for the credit is 60%.

●Notes

Because group works are required in this class, each student should attend at the specified research laboratory, which is informed before the first class through NUCTor the other means.

●Contacting Faculty

Question or inquery in each class is recommended, but after the class question by the students will be answered through NUCT or directly.

Reactor Physics 1 (2.0credits) (原子炉物理学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Spring Semester	
Elective/Compulsory	Elective	
Lecturer	"YAMAMOTO Akio" Professor	ENDO Tomohiro Associate Professor

●Course Purpose

Purpose of this lecture is to learn the basics of the reactor physics to predict the behavior of a nuclear reactor core and to analyze nuclear safety. This knowledge is useful to understand nuclear power plants using fission energy and to cultivate the engineering thinking faculty for modeling such a complex system.
In a nuclear reactor, various phenomena are occurred by interactions between neutrons and materials, e.g. the nuclear fission. In order to appropriately design and control a nuclear reactor core, these phenomena should be correctly understood and be accurately predicted. The reactor physics is systematic knowledge that is necessary for reactor design. This lecture contains a basic part of reactor physics.

By acquiring the contents in this lecture, we expect students are able to understand the following topics:
• Calculation of reaction between neutrons and materials using microscopic cross sections
• Calculation of power generation by fission reaction of nuclear fuel
• Explanation of fission chain reaction
• Calculation of spatial distribution of neutron flux based on diffusion theory
• Calculation of criticality mass
• Calculation of energy distribution of neutron flux based on multi energy-group theory
• Explanation of reactivity change due to variation in core temperature
• Burnup calculation for nuclear fuel
• Kinetics calculation for nuclear reactor and explanation about delayed neutron
• Explanation of design and control for nuclear reactor
• Explanation of nuclear safety

●Prerequisite Subjects

Introduction to Nuclear Physics, Quantum Beam Science and Engineering, Mathematics I and Tutorial, Mathematics II and Tutorial

●Course Topics

(1) Orientation: Introduction to reactor physics, structure of reactor
(2) Overview of nuclear physics
(3) Interaction between neutrons and materials: Cross section and neutron flux
(4) Fission and chain reaction
(5) Spatial behavior of neutrons in a reactor: diffusion theory, diffusion equation
(6) Criticality of reactors and effective multiplication factor
(7) Energy distribution of neutrons in a reactor
(8) Dependency of reactivity on temperature: Reactivity coefficient, feedback effect
(9) Reactor burnup
(10) Reactor kinetics
(11) Design and control of reactor
(12) Design of various reactor types
(13) Nuclear safety
(14) Fukushima Dai-ichi nuclear disaster
(15) Summary

A student should review a handout after each lecture to study for the short test in the next lecture.

●Textbook
Handouts will be used.

●Additional Reading
J.R. Lamarsh, A. J. Baratta, Introduction to Nuclear Engineering (3rd Edition), Prentice Hall (2001).

●Grade Assessment
Higher evaluation is adopted for scoring: 'Report(60%) and test during lecture(40%)' or 'report(100%).' The passing mark is 60 points out of 100.

●Notes
According to Guidelines for Activities at Nagoya University During the Novel Coronavirus (COVID-19) Pandemic, face-to-face lectures will not be held.
In this case, I will held the web lectures using "Zoom" instead of the face-to-face classes.
The lecture's URL and short examination will be made known through NUCT (https://ct.nagoya-u.ac.jp/portal).
The lecture attendance will be surveyed for infectious disease control, but will not be used for grading.

In the examination and test during lecture, a scientific calculator is necessary.

●Contacting Faculty
During recess after the lecture, or contact by e-mail.
e-mailt-endo*energy.nagoya-u.ac.jp

Note: Please replace * with @.

Nuclear Fuel Cycle Engineering (2.0credits) (原子力燃料サイクル工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Youichi ENOKIDA Professor

●Course Purpose

In this class, so as to fulfill the educational goal in the Department of Energy Science and Engineering, obtaining fundamental and practical knowledge, skills, and integrated ability on Energy Science and Engineering,as an example of process systems, you study on nuclear energy systems. The lectured are Energy Resources, Nuclear Technology Developments, Nuclear Fuel Cycle Engineering, and Analyses on Process Systems. To learn concepts and fundamentals of process systems on nuclear fuel cycle such as burning-up in nuclear reactors,reprocessing of used nuclear fuels and treatment and disposal of radioactive wastes as well as process analytical methods applicable to the common engineering problems is purpose of this class, the final educational goals in this class are the following;1) you can explain the current status of energy demand and supply domestically and worldwide from a stand-point of Energy Resources Theory,2) you can quantitatively explain global environmental issuers.3) you can explain elemental discovery of uranium, man-made nuclear reactor on a chain reaction of nuclear fission, atoms for peace activities of research and development on international organization, discovery of natural nuclear reactor site from a stand-point of nuclear technology developments,4) you can explain the definition of nuclear fuel cycle and an example,5) You can tell the current status of domestic and world-wide nuclear power generation,6) you can explain process systems for uranium enrichment and nuclear fuel fabrication,7)you can tell burning-up of nuclear fuel, i.e. composition alteration of fuel,8) you can explain reprocessing and recycling of used nuclear fuel.9) you can calculate uranium utilization on some typical nuclear fuel cycles,10) you can analyze a separation process based upon counter-current separation theory,11) you can explain low-level nuclear waste management,12) you can explain high-level nuclear waste management,13) you can tell decommissioning of nuclear power plant and nuclear non-proliferation.

●Prerequisite Subjects

Fundamental Chemistry 2 and Engineering Thermodynamics

●Course Topics

1. Global Outlook of Energy Resources2. Outlook of Energy Demand and Supply in Japan,3. Global Environmental Issues, 4. A Brief History on Atomic Power Development 5. Outline of Nuclear Fuel Cycle of Nuclear Fission Rectors, 6. Current Status of Nuclear Power Use, 7. Uranium Enrichment and Fuel Fabrication, 8. Burn-up and Transformation of Nuclear Fuel,9. Process Systems for Used Fuel Reprocessing and Recycling, 10. Uranium Utilization Factor11. Counter-current Multi-stage Separation Theory,12. Low-level Nuclear Waste Management,13. High-level Waste Management, 14. Decomissioning and Nuclear Non-proliferation,15. International Aspects of Nuclear Fuel Cycles,16. Economics of Nuclear Fuel Cycles, and17. Research and Development of Innovative Technologies.Each item will be lectured once in every week in the semester, and after completing the 15 item, a midterm exam is given.

●Textbook

R. G. Cockran et al., The Nuclear Fuel Cycle--- Analysis and Management, American Nuclear Society (1999)is assumed, but statistical information is given for USA and out of dated; updated resumes written in Japanese are distributed in every weekin th class.

●Additional Reading

11) R. Cockran et al., The Nuclear Fuel Cycle-%- Analysis and Management, American Nuclear Society(1999). 2) P. Wilson, The Nuclear Fuel Cycle from Ore to Waste, Oxford University Press (1996). 3) M. Benedict et al.,Nuclear Chemical Engineering, McGraw-Hill(1982).

●Grade Assessment

Mid-tem examination(30%), reports(30%), and final examination (40%). When a student properly solves greater than 60% of problems of multiple-choice, description form, or for numerical calculation appeared at mid-term and final exams pass the class and can obtain a better grade by additional proper reporting on advanced problems assigned in the class a few times.

●Notes

No special condition, but attendance at every lecture is mandatory as well as keeping deadline strictly for submission of a few reports.[About the class in 2022]Due to countermeasure against COVID-19, lectures in the current clas will be given as distance learning, in principal, online or on-demand basis by an assist of NUCT, where MS power point files or youtube videos are provided, you should download the specified files and watch prior to each class. The preparation and review should be performed on NUCT's quizz or reporting features.

●Contacting Faculty

Office Hours: Open door policy from 7:30 a.m. to 4 p. m.-- when he is there, He is usually available. To guarantee availability, make an appointment by sending an e-mail to yenokida@nagoya-u.jp

Energy System Engineering (2.0credits) (エネルギーシステム工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Yoshiyuki TSUJI Professor

●Course Purpose

In this class, students must acquire the following knowledge and abilities at the end of the class.(1) Understand basic concepts for transport and transfer of thermal energy (heat transfer) and energy conversion, and acquire simple design and evaluation skills(2) Learning about application cases in various energy systems(3) Understand the transfer of heat and understand it as a physical phenomenon

●Prerequisite Subjects

Fluid Dynamics, Transport Phenomena, Thermodynamics

●Course Topics

1. Heat generation in thermal energy systems2. Thermodynamics in heat cycles3. Heat Conduction and Heat Transfer(Heat conduction, Heat transfer with forced / natural convection, Boiling /condensing, Radiation) Before the class, study the excersises listed at the end of sections.

●Textbook

Introduce as the lecture progresses

●Additional Reading

Reference books on energy introduction, vector analysis, continuous physical fitness, and heat dissipation are introduced as appropriate according to the progress of the lecture.*Toshio Aihara "Heat-transmitted Engineering" Sokabo*Hideomi Fujita, Seizo Kato "Thermal Energy System" Kyoritsu Publishing Co.*JSME Text Series Heat Engineering*JSME Text Series Fluid Engineering*Heat-transmitting engineering Toshio Aihara

●Grade Assessment

Attendance (20%)Each small test (30%)Final exam (50%)At the above rate, determine whether the purpose of the lecture has been achieved, and pass an achievement of 60%.

●Notes

●Contacting Faculty

Responding to questions: at the end of the lecture and from time to time.Contact:y-tsuji@energy.nagoya-u.ac.jp

Plasma Engineering and Science (2.0credits) (プラズマ理工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	TakaakiFUJITA Professor

●Course Purpose

A lecture on plasma physics and plasma engineering is given. The objective includes understanding motion of single charged particles and motion of plasma fluid.

●Prerequisite Subjects

Mechanics, Electromagnetics, Mathematics 1 with Exercises, Mathematics 2 with Exercises, Quantum Mechanics A

●Course Topics

1. Atomic/molecular process and generation of plasma
2. Fundamental properties of plasma
3. Motion of single charged particles
4. Columb collision and resistivity
5. Magnetohydrodynamics and electromagnetic fluid motion
6. Wave in Plasma
7. Plasma equilibrium and stability
8. Heat and particle ransport in plasma
9. Plasma material interaction
10. Fusion Plasma

●Textbook

Not specified. Notes will be distributed during lecture.

●Additional Reading

Introduction to Plasma Physics and Controlled Fusion(Second Edition) Vol.1 Plasma Physics, F.F. Chen, Prelum Press 1983 (Japanese Translation of First Edition Introduction to Plasma Physics, F.F. Chen, translated by T.Uchida Maruzen 1997)
Introduction to Plasma Science and Engineering, S. Takamura, Morishita Press (in Japanese)

●Grade Assessment

Evaluation by reports(40%) and examination(60%)

●Notes

●Contacting Faculty

T. Fujita
Phone: 052-789-4593
E-mail: fujita@energy.nagoya-u.ac.jp

Nuclear Environment Safety Engineering (2.0credits) (原子力環境安全工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Hiromi YAMAZAWA Professor

●Course Purpose

Environmental impacts of nuclear energy will be discussed by reviewing fundamentals of their mechanisms and evaluation methods to comprehensively understand key issues necessary to ensure environmental safety of nuclear energy.

●Prerequisite Subjects

Health physics, Fluid mechanics, Transport phenomena and exercise, Radiometry A

●Course Topics

1. Comparison of energy sources from environmental perspective2. Radionuclide and exposure pathway3. Mechanisms of material transfer in the natural environment4. Evaluation of material transfer in the natural environment 5. Evaluation of radiological dose6. Dose reduction and emergency preparedness

●Textbook

None.

●Additional Reading

●Grade Assessment

examinations(midterm 30%, final 70%)

●Notes

●Contacting Faculty

ext.3781: yamazawa@nagoya-u.jp

Exercise in Nuclear Engineering Design (2.0credits) (原子力工学設計演習)

Course Type	Specialized Courses
Class Format	Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	4 Spring Semester
Elective/Compulsory	Elective
Lecturer	"YAMAMOTO Akio" Professor

●Course Purpose

The purpose of this study is to analyze the behavior of the reactor during operation and abnormal conditions using a reactor simulator for pressurized water and boiling water reactors, and to deepen the understanding of the physical phenomena occurring inside the reactor. Conduct in a centralized format.

By learning this lecture, the goal is to acquire the following skills.
(1) Understand the behavior of the pressurized water reactor and boiling water reactor during normal operation.
(2) Understand the behavior of the pressurized water reactor and boiling water reactor during transient and accident situations.
(3) Understand how to ensure the safety of the reactor during abnormal situations.

●Prerequisite Subjects

Reactor physics

●Course Topics

1. Outline of PWR and BWR
2. Fundamentals of reactor physics and nuclear safety
3. Control of PWR and BWR
4. Analysis of PWR and BWR under normal operation and accident conditions
5. Presentation for problems

Study reference materials before lecture. After the lecture, a report related to the content of the lecture will be imposed.

●Textbook

Introduce textbooks according to the content of the lecture.

●Additional Reading

Introduce textbooks according to the content of the lecture.

●Grade Assessment

Evaluate the level of acquisition of the achievement goals from oral examinations and presentations during the exercise) and reports. Pass if you understand the behavior of the reactor during operation, transients, and accidents.

●Notes

None

●Contacting Faculty

Questions can be taken during breaks after class or at any time. In the latter case, make an appointment in advance.

Basic Engineering for Fusion Energy (2.0credits) (核融合エネルギー基礎工学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	4 Spring Semester	
Elective/Compulsory	Elective	
Lecturer	Kiyomasa WATANABE Professor	Teruya TANAKA Associate Professor

●Course Purpose

Fusion power reactor as a system for generating fusion energy is lectured.

Purpose
1. Realize the role of fusion power reactor in global environment and energy issues
2. Understand the plasma and its control for realizing fusion power generation.
3. Realize important elements of fusion power reactor and understand the technology.

●Prerequisite Subjects

Mathematics I,IIMechanics I,IIElectromangetics I,II

●Course Topics

1. Role of fusion power reactor in global environment and energy issues
2. Magnetized plasma in fusion power reactor
3. Control of fusion plasmaconfinement, heating, diagnostics, fueling
4. Elements of fusion reactormagnetic field, vacuum vessel, pumping fueling, heating diagnositcs, divertor, plasma facing components, Blanket, fuel circulation, fuel breeder, heat exchanger, maintenance, safety control

After evry class, please read the distributed documents once more. You should submit some reports.

●Textbook

Supplementary notes will be distributed during lecture.

●Additional Reading

A book for Fusion Energy, Nikkan Kogyo Shinbun Sya 2005.
F. F. Chen, “An indispensable truth”, Springer 2011.

●Grade Assessment

Evaluation by reports

●Notes

There is no certificate to take this course.

●Contacting Faculty

Contacting Faculty
Kiyomasa Watanabe (kiyowata@lhd.nifs.ac.jp)
Teruya Tanaka (tanaka.teruya@nifs.ac.jp)

Laws and Regulations Associated with Nuclear Engineering (1.0credits) (原子力関係法規)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Spring Semester	
Elective/Compulsory	Elective	
Lecturer	Part-time Faculty	Part-time Faculty

●Course Purpose
The objective of this lecture is to understand laws and regulations associated with radiations and nuclear reactor.

●Prerequisite Subjects
Health phisics

●Course Topics
1.Laws and regulations associated with radiation protection.
2.Laws and regulations associated with nuclear reactors in Japan.

Because a number of contents should be studied in a short term as an intensive lecture by a visiting professional lecturer, You must be sure to prepare through e-lerning on NUCT in advance concerning to several on-demand materials provided on NUCT. After each class, you should solve provided excercises after each class to review your understandings.You must submit the final report on the problems which are important in the real world regulation.

●Textbook
The lecture materials will be provided not later than the class through NUCT.

●Additional Reading
Essential materials will be distributed in a class through NUCT.

●Grade Assessment
Reportings on lecture exercises: (50%)
Final reports: (50%)
Students need to obtain at least 60% of the total marks to pass the course.
Credits will be awarded to those students who score 60 or more.Grades followthe criteria in School of Engineering.

●Notes
No special condition is required to take this class, but attendance at every lecture is mandatory as well as keeping deadline strictly for submission of a few reports
[About the class in 2021]
Due to countmeasure against COVID-19, lectures in the current clas will be given as distance learning, in principal, online or on-demand basis by an assist of NUCT, where MS power point files or youtube videos are provided, you should download the specified files and watch prior to each class. The preparation and review should be performed on NUCT's quizz or reporting features.

●Contacting Faculty
Inquery or question on a series of lecture, you can ask directly in the lecture or through NUCT.

Quantum Beam Science and Enegineering (2.0credits) (量子線理工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Kenichi WATANABE Associate Professor

●Course Purpose

The purpose of this course is to acquire the knowledge of fundamental processes of the interaction of quantum beam (high energy ions, high energy photons and neutrons) with mater and to use the knowledge for practical problems.
The goals of this course are
1. Understanding the interactions of high-energy ions with mater.
2. Understanding the interactions of high-energy photons with mater.
3. Understanding the interactions of neutrons with mater.

●Prerequisite Subjects

Mathematics, Mechanics, Atomic physics, Electromagnetism, Quantum mechanics

●Course Topics

1. Dynamics of particle scattering
2. Scattering cross section
3. Energy loss of high energy ions
4. Transmission and range of high energy ions
5. Interactions of high energy photons with matter
6. Interactions of neutrons with matter
7. Radiation therapy

Please read the lecture notes distributed in this course before and after lectures. Some reports will be assigned.

●Textbook

Text book may be introduced appropriately.

●Additional Reading

Kensho Ito, Houshasen bussei (Radiation and solid states)

●Grade Assessment

To pass this course, students must understand the fundamental processes of interactions of quantum beam (high energy ions, high energy photons and neutrons) with mater.

●Notes

There is nothing required to take this course.

●Contacting Faculty

Contact: k-watanabe@energy.nagoya-u.ac.jp
Kenichi Watanabe (Dep. Energy science and engineering)

Radiation Health Physics (2.0credits) (放射線保健物理学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Jun MORIIZUMI Associate Professor

●Course Purpose

Goals:
Basic knowledge of radiation protection and health effects is lectured for handling safely ionizing radiation and radioactive materials, which are widely used in many engineering, agricultural, scientific and medical fields, etc. Comprehensive views on "risk and benefit", relating to both natural and social sciences, will be understood.

Objectives:
The students will understand
1. the basics of radiation protection,
2. the health effects of radiation and concept of its risk management, and
3. the meanings of values of dose rates on radiation handling.

●Prerequisite Subjects

Basics of physics, electromagnetics and chemistry are essential.
Biology, meteorology and geology are desirable.
(For students of Year 2016 entrance and earlier) Lectures on Nuclear Physics, Nuclear Radiation Physics, Nuclear Radiation Measurement, and Laws and Regulations Associated with Quantum Energy are related.
(For students of Year 2017 entrance and later) Lectures on Introduction to Nuclear Physics, Quantum Beam Science and Engineering, Radiation Metrology A, Nuclear Environment Safety Engineering, and Laws and Regulations Associated with Quantum Energy are related.

●Course Topics

0. Basics of ionizing radiations, radioactivity and isotopes,
1. Quantities and units for radiation and health physics,
2. Health effects due to radiation exposure,
3. Environmental radioactivities and radiations,
4. Principle, basics and implementation of radiation protection, 5. Radiation dosimetry, and
6. Instruments and monitoring for radiation protection.

Short questions on the key topics about health physics will be set every lesson, requiring submission of a report within 1 week or so. The students should review the lesson with the textbook and/or handouts.

●Textbook

Textbook: "Houshasen to Anzen ni Tsukiau: Riyou no Kiso to Jissai (To associate safely with ionizing radiations: Basics and practices of usage)" (written in Japanese), ISBN978-4-8158-0875-4.
Hand-outs will be given on the lecture.

●Additional Reading

Radiation Safety, Ed. T. Kosako (Ohmsha) (written in Japanese), ISBN978-4-274-21323-6.

●Grade Assessment

To earn the credit, the students are required to explain correctly the basic characteristics on health effects by radiation, the principles of radiation protection and terminology relating to health physics, and also required to calculate correctly various radiation doses according to their definitions.
The score is evaluated synthetically by the term examination (80%) and the weekly task reports (20%) (total

of 100%).

●Notes

No special prerequisite for taking this class.

●Contacting Faculty

ad libitum. The use of "Messages" in NUCT system is recommended.

Radiation Metrology A (2.0credits) (放射線計測学Ａ)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Hideki TOMITA Associate Professor

●Course Purpose
Understanding of fundamental aspects of nuclear radiation detection and measurement

●Prerequisite Subjects
Electromagnetics I, Introduction to Nuclear Physics, Quantum Beam Science and Engineering, Radiation Health Physics, Outline of Electrical and Electronics Engineering

●Course Topics
1.Interaction of radiation with matter
2.General Properties of Radiation Detectors
3.Gas detectors
4.Solid-State Detectors
5.Scintillation Detectors (and photo detectors)
6.Applications of radiation detector

●Textbook
None

●Additional Reading
Measurement and Detection of Radiation 3rd ed., N. Tsoulfanidis &. S. Landsberger, CRC Press, 2010
Radiation Detection and Measurement 4th ed., G.F. Knoll, Wiley and Sons,Inc., 2010

●Grade Assessment
Reports and examination

Grade point:
Pass mark is more than 60 points for full marks of 100 points.

(For students of Year 2020 entrance and later)
100-95:A+, 94-80:A, 79-70:B, 69-65:C, 64-60:C-, <59:F

(For students of Year 2019 entrance and earlier)
100-90:S, 89-80:A, 79-70:B, 69-60:C, <59:F

●Notes
None

Please check the NUCT site of this course.

●Contacting Faculty
Please take an appointment to the instructor with an e-mail.

Addressh-tomita(at)energy.nagoya-u.ac.jp
(Please replace (at) with @.)

Radiation Metrology B (2.0credits) (放射線計測学Ｂ)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	4 Spring Semester
Elective/Compulsory	Elective
Lecturer	Akira URITANI Professor

●Course Purpose

You will learn practically about neutron measurement, applied radiation measurement (energy measurement, imaging, etc.) and signal processing from practical point of view of advanced radiation measurement.
By attending this course, you will be able to create and design radiation measurement systems with special functions.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Training in Nuclear Reactor (1.0credits) (原子炉実習)

Course Type	Specialized Courses
Class Format	Experiment and Exercise
Course Name	Department of Energy Science and Engineering
Starts 1	4 Spring Semester
Elective/Compulsory	Elective
Lecturer	Kenichi WATANABE Associate Professor

●Course Purpose

For further understanding of the lectured nuclear reactor physics and nuclear instrumentation, some typical training experiments will be made by operating a small reactor, for example Kinki University UTR, and using a higher neutron flux than those obtained in Nagoya University

The goals of this course are

1. Understanding fundamentals in reactor control and kinetics.
2. Understanding fundamentals in radiation measurements related to reactor experiments.
3. Understanding features of neutron radiography.

●Prerequisite Subjects

Reactor physics,Fundamentals of Nuclear Radiation Measurements

●Course Topics

1.Operation of reactor and evaluation of excess reactivity of control rods
2.Measurement of air dose rate and gamma:-ray spectrum in the reactor room
3.Neutron radiography

●Textbook

Original text for training of nuclear reactor:(in Japanese)

●Additional Reading

1Introduction to Nuclear Reactor Theory: John R. Lamarsh: Amer Nuclear Society
2. Measurement and Detection of Radiation: Tsoulfanidis, Nicholas: Taylor & Francis

●Grade Assessment

To pass this course, students must understand fundamentals of reactor experiments (reactor physics and radiation measurements).

Students will be evaluated by a training report.

●Notes

There is nothing required to take this course.

●Contacting Faculty

Contact: k-watanabe@energy.nagoya-u.ac.jp
Kenichi Watanabe (Dep. Energy science and engineering)

Radiobiology (1.0credits) (放射線生物学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Autumn Semester	
Elective/Compulsory	Elective	
Lecturer	Part-time Faculty	Part-time Faculty

●Course Purpose

The purpose of this lecture is to understand basic concepts on the biological effects of ionizing radiation.
Aims:
1. To understand the basics of damage on biomolecules and DNA repair mechanisms
2. To understand the cellular effects of ionizing radiation
3. To understand the effects of ionizing radiation on human

●Prerequisite Subjects

Nuclear Radiation Measurement, andRadiation Health Physics

●Course Topics

1. Basics of biological knowledge
2. DNA damage and repair
3. Cellular effects of radiation
4. The acute effects
5. The late effects
6. The genetical effects
7. Medical applications of radiation

●Textbook

Hand-outs will be given.

●Additional Reading

Fundamentals of Radiology, Eds. T. Aoyama and O. Niwa, Kinpodo (Japanese)

●Grade Assessment

Examinations (At least 60% of the score is necessary to pass)

●Notes

Before every lecture, handout of the slides used in the class will be given on demand-wise using NUCT; A student should look and read and try to understand them, which is necessary as preparation. a few excercises to confirm if a student understand the content of the lecture are given at every lecture; A student should solve them as a part of the review.

●Contacting Faculty

After each lecture, uestion and request on the lecture will be responded through the professor in charge for the guest lecturer.The final answer would be given in a week or as soonas possible.

Accelerator Engineering (1.0credits) (加速器工学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	4 Spring Semester	
Elective/Compulsory	Elective	
Lecturer	Part-time Faculty	Part-time Faculty

●Course Purpose

Students learn basic physics and engineering related to accelerators that accelerate charged particles including electrons and ions, putting emphasis on understanding of the basic principles. Application of accelerators and recent researches using the accelerators are also introduced.

●Prerequisite Subjects

Electromagnetics I and II, Plasma Engineering and Science, and so on.

●Course Topics

1. History of accelerators
2. Electrostatic accelerators
3. High-frequency accelerators linear accelerators, circular accelerators
4. Technology related to accelerators
5. Recent accelerator technology and researching using accelerators
6. Recent advences in researches using accelerators

●Textbook

No specific textbook would be specified. The lecture materials are distributed accordingly through NUCT.

●Additional Reading

The references are to be specified in the course.

●Grade Assessment

Evaluation by attendance and examinations or reports. 60%of the total point is required to pass.

●Notes

No special conditionis required to take this class.

●Contacting Faculty

You can submit any inqueries or questions through NUCT after each class.

Mechanics of Materials (2.0credits) (材料力学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Elective
Lecturer	Eiji IKENAGA Associate Professor

●Course Purpose

In this lecture, the goal and aim is for students to have the following knowledge and skills at the end of the lesson.1. Understand the dynamics of materials related to energy science and engineering from basics to applied.2. To acquire the ability to solve basic problems of material mechanics.

●Prerequisite Subjects

mechanics, materials science, applied math.

●Course Topics

1. Basics of statics (moment of force)2. Stress-strain3. Stress-strain curve4. Deformation of stick and board of materials (1)5. Deformation of stick and board of materials (2)6. Statically indeterminate problem7. Thermal stress8. Shear stress of beam9. Bending stress of beam10. Deflection of beam (1)11. Deflection of beam (2)12. Torsion of a cylindrical shape(1)13. Torsion of a cylindrical shape(2)14. Exercise15. Final term examinationSubmit a report assignment every time. The answer to the report will be explained at the beginning of each lecture so that you can deepen your understanding.

●Textbook

Basically, Documents of lecture will be distributed every time.

●Additional Reading

1. A 1st course in mechanics of materials: Masashiro Arai (ISBN978-4-06-155797-0 C3053)2. JSME text series Mechanics of materials (ISBN978-4-88898-158-3 C3353)

●Grade Assessment

(Evaluation method) The total score for each report submission is 40%, and the term-end examination is 60%.(Evaluation criteria) A total of 60 points or more will be passed.

●Notes

●Contacting Faculty

Every time. Contact addressextension number: 5893e-mail: ikenaga@imass.nagoya-u.ac.jp

Energy Materials Science (2.0credits) (エネルギー材料学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Spring Semester
Elective/Compulsory	Elective
Lecturer	Takanori NAGASAKI Professor

●Course Purpose

In every field of engineering, it is essential to understand the basic properties of materials. This course deals with materials science as a basis of engineering with emphasis on the materials used for energy application.

The goals of the course are to
- be able to explain chemical bonding from the quantum-mechanical point of view,
- obtain the knowledge about typical crystal structures,
- understand crystal defects and their effects on crystal properties,
- be able to explain mechanical and electrical properties of materials from the microscopic point of views,
- be able to explain characteristics of nuclear materials.
- understand variety of materials and importance of materials research.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Solid-state Physics A (2.0credits) (物性物理学Ａ)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Junji YUHARA Associate Professor

●Course Purpose

This course deals with the basic physical properties of crystalline materials as crystal structure, diffraction, and phonon as a basis of energy engineering.

●Prerequisite Subjects

●Course Topics

1. crystal structure and lattice
2. Crystal diffraction
3. Chemical bonding
4. Lattice vibration
5. Phonon and heat capacity
6. Free electron theory
7. Thermal and electrical conductivity of metals
8. Electrons in periodic potentials

●Textbook

●Additional Reading

C. Kittel, Introduction to Solid State Physics, John Wiley and Sons

●Grade Assessment

●Notes

●Contacting Faculty

Solid-state Physics B (2.0credits) (物性物理学Ｂ)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Masato NAKAYA Associate Professor

●Course Purpose

The objective of this lecture is to learn how to characterize the condensed matters and how to understand their electric, magnetic, thermal and optical properties through fundamental properties of their constituent atoms and electrons by means of quantum mechanics and statistical mechanics.

●Prerequisite Subjects

Quantum Mechanics, Statistical Mechanics,Thermodynamics, Solid-state Physics A, Electromagnetics

●Course Topics

1. Structure of atoms
2. Chemical bonds in solids
3. Structures of solids
4. Energy band structure of solids
5. Defect, impurity, and surface
6. Carrier transport in solids
7. Electronic structure of semiconductors
8. Structure and mechanism of semiconductor devices

●Textbook

Handouts will be provided in each lecture.

●Additional Reading

Introduction to Solid State Physics, C.Kittel,
Solid State Physics (Japanese), Y.Ie,
Solid State Physics (Japanese), M.Tsukada
Transport Phenomena in Solids (Japanese), S.Uchida

●Grade Assessment

Grades will be evaluated by discussion in lectures, reports, and examination.

●Notes

It is desirable that students have already earned credits for Solid-state Physics A.

●Contacting Faculty

Every time.
Masato Nakaya)
Office: Building No.9(west wing), Room 419,
Tel: 052-789-3785,
E-mail: m-nakaya[at]@energy.nagoya-u.ac.jp

Solid-state Chemistry (2.0credits) (固体化学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Takanori NAGASAKI Professor

●Course Purpose

This course deals with crystal structures, crystal defects and phase equilibrium, which are closely related to the function of inorganic materials. It also introduces the preparation methods of inorganic solid materials.

The goals of the course are to
- obtain the basic knowledge about typical crystal structures,
- understand the chemistry of point defects,
- understand the thermodynamics which controls multi-phase equilibrium,
- be able to read equilibrium phase diagrams,
- understand the principles and features of various preparation methods for inorganic materials.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Crystal Physics (2.0credits) (結晶物理学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	TomoakiYAMADA Associate Professor

●Course Purpose

The aim of this course is to help students acquire an understanding of crystal physics. Starting from the basics of crystal and lattice, the crystal symmetry, such as symmetry element and point group, the physical property of crystal and its relationship to the tensors will be discussed.
The goal of this course is to have the necessary knowledge needed to perform the research and development on energy-related crystalline materials.

●Prerequisite Subjects

Energy Materials Science, Solid-state Physics A, Solid-state Physics B

●Course Topics

The following contents will be taught:
- Introduction
- Crystal and lattice
- Symmetry element and point group
- Physical property of crystals
- Tensors
- 2nd-rank tensor and physical property
- 3rd-rank tensor and physical property
- 4th-rank tensor and physical property
- Analytical methods for crystal symmetry and physical properties

In each lecture, the exercise will be given. The students are expected to review the contents they learned after each lecture.

●Textbook

Lecture notes will be provided in the class.

●Additional Reading

References will be introduced in the class according to need.

●Grade Assessment

Evaluation is based on the performance of exercises (50%) and examination (50%). Minimum requirement to obtain the credit is to understand the basics of crystal symmetry and the relationship between crystal symmetry and physical property.

●Notes

This course will be taught in Japanese.

●Contacting Faculty

After lectures. Otherwise, contact by phone (4689) or Email (t-yamada@energy.nagoya-u.ac.jp).

Quantum Beam for Analytical Science (2.0credits) (量子ビーム分析科学)

Course Type	Specialized Courses		
Class Format	Lecture		
Course Name	Department of Energy Science and Engineering		
Starts 1	4 Spring Semester		
Elective/Compulsory	Elective		
Lecturer	Takanori NAGASAKI Professor	Jun ONOE Professor	Shinya YAGI Professor
	Eiji IKENAGA Associate Professor	Hideki TOMITA Associate Professor	Masato NAKAYA Associate Professor
	TomoakiYAMADA Associate Professor	Junji YUHARA Associate Professor	

●Course Purpose

Analysis of materials is, in a word, none other than to identify arrangement, electronic state and motion of constitutive atoms. Quantum beams such as x-ray (synchrotron radiation), electrons, neutrons and laser are very powerful tools to probe those properties. In this course, those who utilize quantum beam in their research give a systematic lecture on principle and application of the analysis using quantum beams.

At the end of the course, participants are expected to
- be able to explain the principles and applications of the quantum beam analysis,
- be able to select the appropriate technique for a specific application.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Quantum Chemistry for Materials Science (2.0credits) (量子材料化学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Jun ONOE Professor

●Course Purpose

In order to understand the properties of materials, it is essential to acquire chemical bond concepts based on electronic theory. In this lecture, students will learn the concept of quantum chemistry, which is the foundation of the course, and give a lecture on the basics of molecular orbital methods for concrete calculation.

Achievement targets

1. Understand and explain the breakdown of classical mechanics and basic concepts of quantum mechanics.
2. Calculation using Schroedinger equation is possible.
3. Explain and explain chemical bonds in gas, liquid, and solid materials by the concept of quantum chemistry.
4. Explain the nature or function of materials using knowledge of quantum chemistry.

●Prerequisite Subjects

Fundamental Chemistry I, Solid State Physics A/B, Physical Chemistry

●Course Topics

1.Fundamentals of quantum chemistry 2.Hydrogen atom 3.Theory of chemical bonding 4.Concepts of molecular orbital 5.Fundamental calculation method of molecular orbitals 6. application to functional materials.

To prepare for and review the relevant part of the textbook. The textbook exercise will be assigned as a report assignment, so submit the answer by the due date.

●Textbook

●Additional Reading

●Grade Assessment

Evaluate with a final exam of 100%, with a score of 60 out of 100.

A +: 95 points or more, A: 80 points or more, B: 70 points or more, C: 65 points or more, C-: 60 points or more, F: less than 60 points

●Notes

For the implementation method for this course, we plan to give face-to-face lectures basically.

But, when the situation of Covid-19 becomes worse, we will switch to use online lectures from time to time.

●Contacting Faculty

Respond at break time or office hours after the lecture.

Technical Writing (2.0credits) (テクニカルライティング)

Course Type	Specialized Courses		
Class Format	Lecture		
Course Name	Department of Materials Science and Engineering	Department of Physical Science and Engineering	Department of Energy Science and Engineering
	Department of Electrical Engineering, Electronics, and Information Engineering	Department of Mechanical and Aerospace Engineering	Civil Engineering
	Architecture		
Starts 1	4 Spring Semester	4 Spring Semester	4 Spring Semester
	4 Spring Semester	4 Spring Semester	4 Spring Semester
	4 Spring Semester		
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	Elective
	Elective		
Lecturer	Emanuel LELEITO Lecturer	Gang ZENG Lecturer	GRIB Dina Lecturer

●Course Purpose

This course is to learn the logical thinking and the method of expression for sending scientific and technical contents to others in English and learn how to apply these methods to technical writing and presentation in English.

What you will get in this course:
1. Understand logical thinking and structure issues.
2. Understand and write the document structure that leads to problem solving.
3. Write abstracts of scientific and technical papers in English.
4. Apply the above methods to presentations and debates in English.

●Prerequisite Subjects

This course will be taught from the basics, background subjects are not specified.

●Course Topics

1. Research skills
1.1 Academic literacy and critical reading
1.2 Logical thinking and structuring logic
1.3 Avoiding plagiarism
2. Writing skills
2.1 Understanding document structure
2.2 Organizing document structure
2.3 Writing abstracts in English
3. Presentation skills
3.1 Creating slides in English
3.2 Presentation and Q & A in English
3.3 Discussion in English

Students are required to read related contents of next lecture in advance. Reports will be assigned after each lecture, which should be completed independently by searching necessary information. Reports and final presentation will be used for evaluation.

●Textbook

No textbook is specified. Lecture materials will be distributed in each class.

●Additional Reading

A Manual for Writers of Research Papers, Theses, and Dissertations: Chicago Style for Students and Researchers (Chicago Guides to Writing, Editing, and Publishing) - Kate L. Turabian, Revised by Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, Joseph Bizup, William T. FitzGerald and the University of Chicago Press Editorial Staff.

●Grade Assessment

Evaluation will be conducted based on reports and final presentation. Credits will be awarded to those students who can write abstract and present idea using basic skills.

●Notes

●Contacting Faculty

Questions will be accepted during or after the lecture.

Graduation Thesis A (5.0credits) (卒業研究A)

Course Type	Specialized Courses	
Class Format	Experiment and Exercise	
Course Name	Department of Energy Science and Engineering	
Starts 1	4 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

The objective is to learn how to plan, perform, summarize and present a research related to Energy Science and Engineering.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

Oral presentation on the context of what have been done for the Bachelor's thesis and discussion on the presentation.

●Notes

●Contacting Faculty

Graduation Thesis B (5.0credits) (卒業研究Ｂ)

Course Type	Specialized Courses	
Class Format	Experiment and Exercise	
Course Name	Department of Energy Science and Engineering	
Starts 1	4 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

The objective is to learn how to plan, perform, summarize and present a research related to Energy Science and Engineering.

●Prerequisite Subjects

●Course Topics

To perform a research related to Energy Science and Engineering, write a paper and make a presentation on the results.

●Textbook

●Additional Reading

●Grade Assessment

Oral presentation on the context of the Bachelor's thesis and discussions on the presentation.

●Notes

●Contacting Faculty

Energy Science and Engineering Seminar A (1.0credits) (エネルギー理工学輪講Ａ)

Course Type	Specialized Courses	
Class Format	Circle form	
Course Name	Department of Energy Science and Engineering	
Starts 1	4 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

The aim is to learn the fundamental knowledge and status of recent research in the relevant field, which form the basis of his/her own research and study.Each student would reach at the goal after completing the class; Obtaining the knowledge and abilitty to explain fundamentals (concept, theory, important experimental facts, mechanisms), which are basics of the scientific field in the research laboratory; andObtaining ability to explain the student's own research issue in the recent advancesin the field.

●Prerequisite Subjects

All specialized classes opened at the department of Energy Science and Engineering, School of Engineering. Several classes of the most important subjects may be specified by the professors in each research laboratory.

●Course Topics

Through a group work, appreciation of textbook or a peace of scientific publication in English language is trained as well as obtaining the knowledge on the related scientific fields. In general, group works include the folowing contents as examples;1) By self-learning on the specified part of the publication, a student should understand the contexts and summerize them in a document..2) By presentation in a group work and join Q and A and discussion.3) By reflecting the discussion, a student prepare the final report or oral presentation in English or Japanese, which would be specified by lecturers in each group

●Textbook

Textbooks or equivalentreferences will be introduced in the research laboratory through NUCT or directly.

●Additional Reading

References or equivalent scientific papers will be introduced in the research laboratory through NUCT or directly.

●Grade Assessment

Attendance and performing the colloquium is mandatory. 60% of the total score is necessary to obtain the credit.

●Notes

Because group works are required in this class, each student should attend at the specified research laboratory, which is informed before the first class through NUCTor the other means.

●Contacting Faculty

Question or inquery in each class is recommended, but after the class question by the students will be answered through NUCT or directly.

Energy Science and Engineering Seminar B (1.0credits) (エネルギー理工学輪講Ｂ)

Course Type	Specialized Courses	
Class Format	Circle form	
Course Name	Department of Energy Science and Engineering	
Starts 1	4 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

The aim is to learn the fundamental knowledge and status of recent research in the relevant field, which form the basis of his/her own research and study.Each student would reach at the goal after completing the class; Obtaining the knowledge and abilitty to explain fundamentals (concept, theory, important experimental facts, mechanisms), which are basics of the scientific field in the research laboratory; andObtaining ability to explain the student's own research issue in the recent advancesin the field.

●Prerequisite Subjects

All specialized classes opened at the department of Energy Science and Engineering, School of Engineering. Several classes of the most important subjects may be specified by the professors in each research laboratory.

●Course Topics

Through a group work, appreciation of textbook or a peace of scientific publication in English language is trained as well as obtaining the knowledge on the related scientific fields. In general, group works include the folowing contents as examples;1) By self-learning on the specified part of the publication, a student should understand the contexts and summerize them in a document..2) By presentation in a group work and join Q and A and discussion.3) By reflecting the discussion, a student prepare the final report or oral presentation in English or Japanese, which would be specified by lecturers in each group.

●Textbook

Textbooks or equivalentreferences will be introduced in the research laboratory through NUCT or directly..

●Additional Reading

References or equivalent scientific papers will be introduced in the research laboratoryt hrough NUCT or directly.

●Grade Assessment

Attendance and performing the colloquium is mandatory. 60% of the total score is necessary to obtain the credit.

●Notes

Because group works are required in this class, each student should attend at the specified research laboratory, which is informed before the first class through NUCTor the other means.

●Contacting Faculty

Question or inquery in each class is recommended, but after the class question by the students will be answered through NUCT or directly.

Special Lecture of Energy Science and Engineering 1 (1.0credits) (エネルギー理工学特別講義第１)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Hiromi YAMAZAWA Professor

●Course Purpose

About very introductory contents on radiation and nucleus in nuclear engineering, cooperative lectures of the omnibus form are given by 7 universities (Tokyo Institute of Technology, Kanazawa University, Fukui University, Ibaraki University, Okayama University, Osaka University, Nagoya University) through a remote education system (i.e. an interactive TV system).

●Prerequisite Subjects

None

●Course Topics

The basics of nuclear and radiochemistry
The basics of radioactivity and radiation
Radiation measurement I
Radiation measurement II
Environmental radioactivity
Influence of the radiation on human body
Radiation health science
Nuclear basic property I
Nuclear basic property II
Nuclear reaction I
Nuclear reaction II
Nuclear fission
The basics of nuclear transmutation study
Nuclear transmutation engineering
Basic engineering outline of light water nuclear reactors

●Textbook

The document of the presentation will be distirbuted every each lecture.

●Additional Reading

Introductory reference will be intoroduced every each lecture.

●Grade Assessment

More than 4 reports chosen from the 15 problems questioned by every each lecture.

Grade point:
Pass mark is more than 60 points for full marks of 100 points on each report. The notation of the grade is given by S;100-90 points, A;89-80 points, B;79-70 points, C;69-60 points, and F; less than 59 points.

●Notes

●Contacting Faculty

If you have questions, please contact the lecturer in charge of each lecture by an E-mail.

Special Lecture of Energy Science and Engineering 2 (1.0credits) (エネルギー理工学特別講義第２)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Autumn Semester	
Elective/Compulsory	Elective	
Lecturer	Part-time Faculty	Part-time Faculty

●Course Purpose

Selected topics or recent knowledge related to Energy Science and Engineering will be provided by the specialists in these areas, or scientific tours in a nuclear power plant.The final goals of this class are as follows;1) You can explain briefly a few topics on the recent advances in Energy Science and Engineering, and2) You have understood and can present about the recent research and development status of the art of the relevant area concerning to the classes learned in the Department.

●Prerequisite Subjects

Outline of Energy Science and Engineering, and Introduction to Energy Science and Engineering

●Course Topics

Lectures would be given on current topics by the specialists from other universities or reserach Institutes, as well as scientific tour to a nuclear power plant.You should be sure to prepare in advance to study specified lecture materials if required. Before submiting the final reports, you should review your class by the lecturers and on the scientific tour.

●Textbook

The lecture materials are specified or provided through NUCT etc.

●Additional Reading

The lecture references are specified or provided through NUCT etc.

●Grade Assessment

Examination or report. Attendance at the scientific tour is mandatory and you should submit the final reports or take the final examination. Credits are obtained to gain 60% of the total evaluation and grades follows the criteria by School of Engineering.

●Notes

No special condition is required to take this class, but.for the scientific tour, you need an in-advance-registration and formal ID card with photograph such as driver's license, passport, where University student ID is not acceptable. Be aware of information concerning to the class which are displayed on the department notification board, NUCT, or sent by e-mails.

●Contacting Faculty

Because inquiries are to be answered by the professors in charge of your academic year, ask one of them. On the scientific tour, Qustions are highly recommended on the site of the tour.

Special Lecture of Energy Science and Engineering 3 (1.0credits) (エネルギー理工学特別講義第３)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	3 Autumn Semester	
Elective/Compulsory	Elective	
Lecturer	Part-time Faculty	Part-time Faculty

●Course Purpose

Selected topics or recent knowledge related to Energy Science and Engineering will be provided by the specialists in these areas, or scientific tours in a nuclear power plant.The final goals of this class are as follows;1) You can explain briefly a few topics on the recent advances in Energy Science and Engineering, and2) You have understood and can present about the recent research and development status of the art of the relevant area concerning to the classes learned in the Department.

●Prerequisite Subjects

Outline of Energy Science and Engineering, and Introduction to Energy Science and Engineering

●Course Topics

Lectures would be given on the current topics by the specialists from other universities or reserach Institutes, as well as scientific tour to a research facility on nuclear fusion.You should be sure to prepare in advance to study specified lecture materials if required. Before submiting the final reports, you should review your class by the lecturers and on the scientific tour.

●Textbook

The lecture materials are specified or provided through NUCT etc.

●Additional Reading

The lecture materials are specified or provided through NUCT etc.

●Grade Assessment

Examination or report. Attendance at the scientific tour is mandatory and you should submit the final reports or take the final examination. Credits are obtained to gain 60% of the total evaluation and grades follows the criteria by School of Engineering

●Notes

No specific condition is required.Because the schedule of the scientific tour would be anounced after the agreement with the research institute and registration is requied due to the li9mited availability of transportation, you should be aware of notices given through NUCT etc.

●Contacting Faculty

Because inquiries are to be answered by the professors in charge of your academic year, ask one of them. On the scientific tour, Qustions are highly recommended on the site of the tour.

Outline of Engineering 1 (1.0credits) (工学概論第１)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Chemistry and Biotechnology	Department of Materials Science and Engineering	Department of Physical Science and Engineering
	Department of Energy Science and Engineering	Department of Electrical Engineering, Electronics, and Information Engineering	Department of Mechanical and Aerospace Engineering
	Civil Engineering	Architecture	
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	Elective
	Elective	Elective	
Lecturer	Part-time Faculty		

●Course Purpose

Based upon the wide and deep experiences, alumini and/or aluminae of Nagoya University, who work the hub of society,give future perspectives, foster internal and external active personality and propose guideline for their further study.

●Prerequisite Subjects

Because it is a common subject not to affect a specialized subject, I do not appoint the subject to become the background.

●Course Topics

Experience every time own as "do your best younger student" a senior playing an active part in the social center I perform a class on the basis of this. In all eight times of classes, I perform orientation and the lecture by seven outside lecturers. What I check about a lecturer and a title released before a class of every time beforehand. After a lecture, conduct an additional investigation depending on the need including contents and the phrase handled in a lecture. In addition, submit it as you impose the report problem about lecture contents every time.

●Textbook

I distribute a slide or the print which the person in charge of each time lecturer uses as a lecture document.

●Additional Reading

Instructions will be given as necessary in class

●Grade Assessment

I evaluate an acquirement degree for the accomplishment by a report. I keep lecture contents of every time under control, and it is said that I pass if I can collect own thought and lets results reflect it according to the depth of the contents which were able to learn it such as the grasp of lecture contents, a guideline for the future dream, study of oneself.

●Notes

●Contacting Faculty

I cope after a lecture every time. Or ask the staff of the educational affairs section.E-mail:t-nagasaki@energy.nagoya-u.ac.jp

Outline of Engineering 2 (1.0credits) (工学概論第２)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Chemistry and Biotechnology	Department of Materials Science and Engineering	Department of Physical Science and Engineering
	Department of Energy Science and Engineering	Department of Electrical Engineering, Electronics, and Information Engineering	Department of Mechanical and Aerospace Engineering
	Civil Engineering	Architecture	
Starts 1	4 Spring Semester	4 Spring Semester	4 Spring Semester
	4 Spring Semester	4 Spring Semester	4 Spring Semester
	4 Spring Semester	4 Spring Semester	
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	Elective
	Elective	Elective	
Lecturer	Part-time Faculty		

●Course Purpose

It is recognized as an urgent issue to create low-carbon society in order to mitigate global warming. The objective of this lecture is to understand the current situation of Japan in terms of energy supply and demand as well as technologies of energy conservation and renewable energy utilization. Energy policy of Japan such as Energy Basic Plan is also one of the topics.
It is expected that the lecture provides fundamental understanding of measures to deal with reducing primary energy consumption.

●Prerequisite Subjects

Fundamentals of Engineering

●Course Topics

1. Situation of Japan with respect to energy
2. Energy policy and Energy Basic Plan
3. Solar energy technologies
4. Energy conservation technologies with wasted heat recovory
5. Social systems for low-carbon society
6. Try "Test of Energy"

●Textbook

None.

●Additional Reading

To be distributed in the lecture.
"Test of Energy", http://www.ene-kentei.jp

●Grade Assessment

Reports are required to be submitted during the lecture. The subjects are presented in the lecture.

●Notes

There are no prerequisites.

●Contacting Faculty

All questions are encouraged to be presented during the lecture.

Outline of Engineering 3 (2.0credits) (工学概論第３)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Chemistry and Biotechnology	Department of Materials Science and Engineering	Department of Physical Science and Engineering
	Department of Energy Science and Engineering	Department of Electrical Engineering, Electronics, and Information Engineering	Department of Mechanical and Aerospace Engineering
	Civil Engineering	Architecture	
Starts 1	4 Autumn Semester	4 Autumn Semester	4 Autumn Semester
	4 Autumn Semester	4 Autumn Semester	4 Autumn Semester
	4 Autumn Semester	4 Autumn Semester	
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	Elective
	Elective	Elective	
Lecturer	Emanuel LELEITO Lecturer	GRIB Dina Lecturer	Gang ZENG Lecturer
	Kiyohisa NISHIYAMA Designated Lecturer		

●Course Purpose

This course will introduce the history, the current state and future prospects of R&D (research and development) in various sectors related to the field of engineering in Japan. The course will expose you to a wide range of issues being tackled by engineers in different fields, with the aim of motivating and preparing you to pursue your research interest. You will have an opportunity to explore basic concepts and real-world applications, and to do a mini research tasks leading to a final presentation.

Apart from the engineering field related knowledge, this lecture will also help you develop the following skills:
Cross-disciplinary communication skills
Communication across language barriers (English/Japanese)
Online search and research skills for information gathering
Presentation skills

●Prerequisite Subjects

You do not require any background knowledge to join this class. Each lecturer will provide the basic knowledge that might be needed to understand the lecture topics.

●Course Topics

This class consists of “omnibus-style” lectures on the following topics.

1. Science, Technology and Innovations in Embedded Computing Systems (Gang ZENG)
- This lecture gives an overview of the embedded computing systems related technologies in Japan. In particular, the latest innovations on the low-energy and automotive applications will be introduced.
- The students are asked to participate in group discussion to share their ideas and thoughts about energy conservation and future automobiles.

2. The innovative factors of technologies in Japan (Kiyohisa NISHIYAMA)
- This lecture provides the participants with the concept of 40 innovation principles. Some Japanese technologies are broken down into the combination of the principles as examples.
- The students each are asked to analyse a technology of interest found in Japan. The students will be able to grab the concepts of any technological innovations after completing this lecture.

3. Science, Technology and Innovation for Disaster Risk Reduction (Emanuel LELEITO)
- This lecture gives students an overview of the Scientific and Technology Innovations that have contributed to Japan's leading role in Disaster Risk Reduction (DRR).
- DRR related discussions and presentation in class will help students exercise their creative thinking and problem solving skills.

4. Societal, Cultural and Economic Contexts of Engineering Practice in Japan (Dina GRIB)
- The last part of this course introduces you to the Science, Technology and Society studies (STS) field and provides a brief overview of how Japanese cultural, economic, societal and political tradition affects technological innovation and scientific research as well as how STI in turn affect Japanese culture, society and politics.
- The participants will be invited to conduct a mini case study using online materials, share their findings in class and participate in group discussions.

●Textbook
Lecture materials will be distributed in class during each lecture.

●Additional Reading
References and materials for additional reading will be introduced in class during each lecture.

●Grade Assessment
Credits will be awarded to those students who score over 60 out of 100 based on the following evaluation criteria:

1) Reports (60%): Each lecturer will ask you to prepare and submit reports to valuate your understanding of the topics taught. The reports will be worth 60% of the total score.
2) Presentation (40%): You will be asked to do a final presentation based on one or a combination of the topics taught. The presentation will require that you to do independent online research to gather necessary information and present the topic in 3-5 minutes. Your understanding of the topic as well as the effectiveness of your presentation will be evaluated. The presentation is worth 40% of the total score.

●Notes
None

●Contacting Faculty
Questions are received during or after class time. Lecturers will provide contact information during class orientation.

Outline of Engineering 4 (3.0credits) (工学概論第４)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Chemistry and Biotechnology	Department of Materials Science and Engineering	Department of Physical Science and Engineering
	Department of Energy Science and Engineering	Department of Electrical Engineering, Electronics, and Information Engineering	Department of Mechanical and Aerospace Engineering
	Civil Engineering	Architecture	
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	Elective
	Elective	Elective	
Lecturer	Part-time Faculty		

●Course Purpose

Elementary ClassThis course is intended to teach Japanese to students who have not learnt Japanese before or who have learned only a very little. Basic Japanese which is necessary for daily life in Japan will be taught.
The students study the fundamentals of grammar and basic conversational expressions. The students are requested to communicate in daily life using simple expressions.
Intermediate ClassThis course is intended to teach Japanese to students who already learned Japanese of Elementary level. The aims of this study are to obtain the ability necessary to explain their experiences concretely.
The students are requested to communicate in their study in Japanese. Depending on the students' Japanese ability, the advanced class will also be prepared.

●Prerequisite Subjects

Elementary ClassNone
Intermediate ClassElementary Japanese

●Course Topics

Elementary Class1.Pronunciation of Japanese 2.Structure of Japanese sentences 3.Fundamental vocabulary and expressions 4.Conversation practice 5.Listening practice, Students must read the part which they will study in the next lecture.
Intermediate Class1 Grammar, 2 Conversation, 3 Opinion delivery, 4 Reading comprehension, 5 Listening practice, The students must momorize the most important sentences which they will study in the next lecture.

●Textbook

Elementary ClassNIHONGO Breakthrough, From suruival to communication in Japanese, JAL Academy, ASK Publishing Co.Ltd.

Intermediate Classweekly J ： 6

●Additional Reading

I introduce it to progress appropriately

●Grade Assessment

Elementary ClassClass performance 20Assignments 20Interview test and examination30, Presentation 30
In each item, the ability of comversation is an important check point.
Intermediate ClassClass performance 20Assignments 10Interview test 20Written examination20, Presentation 30.

In each item, the ability of correct expressions is an important check point.
These scores are summed and evaluated. The students with the evaluation S, A, B, or C can pass this subject.

●Notes

This subject is open for NUSIP students.

●Contacting Faculty

Ext. 6797 ishida@nuem.nagoya-u.ac.jp

Engineering Ethics (2.0credits) (工学倫理)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Chemistry and Biotechnology	Department of Materials Science and Engineering	Department of Physical Science and Engineering
	Department of Energy Science and Engineering	Department of Electrical Engineering, Electronics, and Information Engineering	Department of Mechanical and Aerospace Engineering
	Civil Engineering	Architecture	
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	
Elective/Compulsory	Elective	Elective	Elective
	Compulsory	Elective	Elective
	Elective	Elective	
Lecturer	Part-time Faculty		

●Course Purpose

All students will push forward the preparations to a member of society through a college life having high flexibility as well as the lecture of the university, but this is the conscious problem that it is independent and should work on. Therefore, about life, the responsibility of the necessary member of society (a person of occupation and researcher solving another person such as engineers and social problem situation), found ability, ethic, it is the purpose of the class that gets an image at the beginning of student life. I solved many problems until now, and the engineer developed the society, but had much failure, accidents and the ethical disgraceful affair. I understand basic power to act as a member of society, an engineer ethically while having the viewpoint to the future a little while referring to a lot of such failure examples. In addition, I acquire a custom to think on the spot, and to be settled necessary for an engineer, a member of society. (the lecturer is engaged in a study and the business of the engineer ethic in professional engineer (nation qualification) with the work experience.)

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

There are no prerequisites.

●Contacting Faculty

E-mail:roofrate3-nug@yahoo.co.jp

Patent and Intellectual Property (1.0credits) (特許及び知的財産)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Chemistry and Biotechnology	Department of Physical Science and Engineering	Department of Energy Science and Engineering
	Department of Electrical Engineering, Electronics, and Information Engineering	Department of Mechanical and Aerospace Engineering	Civil Engineering
	Architecture		
Starts 1	2 Autumn Semester	4 Autumn Semester	4 Autumn Semester
	4 Autumn Semester	4 Autumn Semester	4 Autumn Semester
	4 Autumn Semester		
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	Elective
	Elective		
Lecturer	Masahiro KITO Professor		

●Course Purpose

Understand the necessity and significance of patents from the viewpoint of researchers and engineers at universities and companies

Acquire basic knowledge of patents and acquire what researchers and engineers who invent should do.

Attainment target

1. Understand the purpose and necessity of the patent system
2. Understand the basics of patent application procedures and how to write application documents
3. Can perform basic patent search
4. Understand how companies and universities use patents

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

No requirement for the course.

●Contacting Faculty

Internship (1.0credits) (インターンシップ)

Course Type	Related Specialized Courses	
Class Format	Practice	
Course Name	Department of Energy Science and Engineering	
Starts 1	Spring Semester	
Elective/Compulsory	Elective	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

In considering an advanced and complicated society, necessity of an internship is increasing year by year. The aim of this lecture is to guide to the internship activity.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

evaluated by examination, report and attendanceReports. 60% to pass

●Notes

●Contacting Faculty

System Control Engineering (2.0credits) (システム制御工学)

Course Type	Related Specialized Courses
Class Format	Lecture
Course Name	Department of Energy Science and Engineering
Starts 1	4 Spring Semester
Elective/Compulsory	Elective
Lecturer	Shinji DOKI Professor

●Course Purpose

This series of lectures give the basic understanding and its implementation
for control various plants (for example, Electric circuit, Robot, Automobile and Chemical Plant) as you want.

Objective of this lecture
1. How to modeling and analysis the plant
2. How to design the controller for control it as you want

●Prerequisite Subjects

Linear Algebra I, II
Take the following lectures is recommended for understanding examples of control plants.
>Fundamental of Physics I
>Electronics Circuits with Exercises
>Linear Circuits with Exercises
>Electric Power Apparatus

●Course Topics

1.State equations
2.Transfer functions
3.Frequency responses
4.Block diagrams
5.Stability analysis
6.Transient state characteristics
7.Steady state characteristics
8.Identification
9.Control system designs
10.System structures
11.Pole location

●Textbook

New interuniversity System and control Ohmsha

●Additional Reading

not used

●Grade Assessment

Examination score of 60% or more is necessary to pass the course.
S:90%-100%
A:80%-89%
B:70-79%
C:60-69%

●Notes

●Contacting Faculty

TEL ext.2778, Email doki@nagoya-u.jp

Introduction to Energy Science and Engineering 2 (2.0credits) (エネルギー理工学概論２)

Course Type	Related Specialized Courses	
Class Format	Lecture	
Course Name	Department of Energy Science and Engineering	
Starts 1	4 Spring Semester	
Elective/Compulsory	Elective	
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose

Facing to the global warming, it becomes an urgent world-wide subject of to build a low-carbon society. The aim of this lecture is to understand the outline of the energy supply/consumption in Japan and world, and the technology concerning energy conservation and renewable energy.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty