Introduction to Electrical Electronic and Information Engineering (2.0credits) (電気電子情報工学序論)

Course Type	Basic Specialized Courses		
Class Format	Lecture		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	1 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

●Course Purpose

The purpose of this course is to introduce the research conducted in the fields of electrical, electronics and information engineering of this department, and to learn the basics of cutting-edge research in electrical, electronics and information engineering.

By learning this lecture, the goal is to be able to:

1. You can understand how each lecture offered in this department will be useful in the future.

2. You can know what kind of research is being conducted in each laboratory in this department.

●Prerequisite Subjects

No specific requirements.

●Course Topics

Each time, faculty members of this department introduce the latest research in any of the following three fields.

1. Electrical engineering
2. Electronics
3. Information and communication engineering

Before each class, check the web page for the contents of the laboratory to which the relevant faculty belongs. After the lecture, you are required to submit a report which contents your understood every time.

●Textbook

Some books will be introduced in the lecture.

●Additional Reading

Some books will be introduced in the lecture.

●Grade Assessment

Evaluation will be based on the submitted report.

●Notes

●Contacting Faculty

Discrete Mathematics with Exercise (3.0credits) (離散数学及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	1 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	Tetsu IWATA Associate Professor	Yojiro MORI Associate Professor	Kenta URANO Assistant Professor
	Chihiro TSUTAKE Assistant Professor		

●Course Purpose

The purpose is to learn the basic principles of discrete mathematics with exercise as basic mathematics in computer science.

Students understand fundamental definitions in a set theory, number theory, and algebraic system, and are able to solve various problems.

●Prerequisite Subjects

High school mathematics.

●Course Topics

1. Set Theory: Set, Relation, Function, Lattice
2. Number Theory: Divisor and Multiple, Prime Number, Indefinite Equation, Congruence Equation
3. Algebraic System: Ring, Group, Homomorphism

For each lecture, students are requested to read the portion of the textbook related to the lecture beforehand.

●Textbook

Akihiro Nozaki. Discrete Mathematics. Kindaikagakusha

●Additional Reading

To be introduced during lectures.

●Grade Assessment

Grading by exercises, reports, and mid-term and end-term examinations. A score of at least 60% is necessary to pass.

●Notes

Lectures will be given both in online and offline.
- Online lectures will be live broadcasted. The recorded video will be uploaded to NUCT after the lecture.
- Physical attendance to the lectures is not required. However, mid-term and end-term exams will be in offline.
- Details on online lectures will be announced via NUCT before the first lecture.

●Contacting Faculty

Questions can be asked during the offline lectures, or by using the message function of NUCT, or by an email.

A class: Tetsu Iwata tetsu.iwata at nagoya-u.jp
B class: Yojiro Mori mori at nuee.nagoya-u.ac.jp

Fundamental Computer Programing with Exercises (3.0credits) (計算機プログラミング基礎及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	1 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	Nobuo KAWAGUCHI Professor	Hiroshi HASEGAWA Professor	Rei MIYATA Assistant Professor
	Kosuke MURATE Assistant Professor		

●Course Purpose

This series of lectures give the basic computer programming techniques for solving various problems by learning computer programming in the C language through exercises. The goals of this course are to develop basic skills of computer programming and computer operations through a text terminal.

●Prerequisite Subjects

Mathematics

●Course Topics

1. Basic operation of programming environment - Text editor (Emacs/Visual Studio Code) - Command line interface -
2. Programming languages and basic of computer system.
3. Basics of the C language - Data types, variables - Control structures - Functions - Standard C library functions (I/O, etc.)
4. Fundamentals of the C language - Structures, Pointers, etc.
5. Application of programming, string functions, recursion, etc.

Preparation: Read the appropriate section of the text book before the class.
Assignments on WebCT will be made for each class.

●Textbook

For the C language, Japanese text book will be used.

[Class A]
The C Language, Kyoritsu Shuppan, ISBN: 978-4320123502

[Class B]
Any textbook on C language can be used. Select according to the preference of each student.

●Additional Reading

Further instruction will be made in each class.

●Grade Assessment

Assignments and Examinations are conducted on NUCT.

Evaluation will be based on:
Attendance tests 20% (A)/25% (B)
Assignment 50% (A)/25% (B)
Examination 30% (A)/50% (B)

(students from 2020)

100-95;A+94-80; A 79-70; B69-65;C64-60;C-, below 59; F

(students before 2019)
100-90; S, 89-80; , 79-70; B, 69-60; C, below 59; F.

●Notes

Any special prerequisite is not required.

[Class A]
In this class, we use Zoom for on-line lecture. We also use pre-recorded videos.
Queries are always welcome during the on-line lectures.
.
[Class B]
The students of this class will be divided into two groups. For each group, on-line lectures with MS Teams and on-site programming practices will be scheduled alternately. Queries are always welcome during the on-line lectures and the on-site practices.

●Contacting Faculty

Questions will be answered in each class.

Linear Circuit with Exercises (3.0credits) (線形回路論及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	1 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	Yoshio HONDA Associate Professor	Katsunori MAKIHARA Associate Professor	Maki KUSHIMOTO Lecturer
	AkioOTA Assistant Professor		

●Course Purpose

As a basis of electric, electronic, and information engineering, characteristics of linear circuit elements and steady states of linear circuits are lectured. The goal of this lecture is to understand followings.

1. Vector and complex notation of alternating voltage, current, and power
2. LCR resonance circuit, mutual inductance, general property and three phase circuit.
(3. Fourier representation of periodic signal and the response of linear circuit to the periodic signal)

●Prerequisite Subjects

Calculus I, II, Complex Analysis, Foundations of Electromagnetics I, II

●Course Topics

1.Circuit elements and circuit equations:2.Sinusoidal ac voltage and current:3.Complex impedance and vector:4.Electric power:5.Resonance circuits:6.Mutual inductance:7.Basic principles of linear circuits:8.Three phase circuit:9.Distorted ac voltage and current

Yor are required to review the contents before each lecture. You may need to submit a report after each lectur.

●Textbook

●Additional Reading

●Grade Assessment

Grades will be evaluated by judging a combination of Midterm Exam (35 Points), Final Exam (50 Points), Short Tests (5 Points), and Reports (10 Points). Minimum points required for passing is 60 Points of total.

●Notes

●Contacting Faculty

Mathematics I and Tutorial A (1.5credits) (数学１及び演習Ａ)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	1 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	Kazuo SHIOKAWA Professor	Hiroki KONDOH Associate Professor	Seiji KATAKURA Assistant Professor

●Course Purpose

To study ordinary differential equations systematically and to understand the relation between physical phenomena and theories

1. To understand the fundamental properties of ordinary differential equations
2. To develop the ability of solving fundamental ordinary differential equations

●Prerequisite Subjects

Elements of Mathematics I-IV
Elements of Physics I, II

●Course Topics

1. First order ordinary differential equations
2. Second and higher order linear ordinary differential equations
3. Series solutions of differential equations
4. Legendre's equation and Bessel's equation
5. Sturm-Liouville problems and orthogonal functions
6. Summary and Evaluation

Practise class provides report subject every time.

●Textbook

Ordinary Differential Equations (Advanced Engineering Mathematics, 8th Edition) by E. Kreyszig, translated by K. Kitamori and M. Hori, Baifukan Co., Ltd.

●Additional Reading

References will be provided in case if they are necessary.

●Grade Assessment

Evaluation is made on the basis of final examination (80%) and the performance in exercises (20%). In case if final examination is not held, evaluations of exercises and lecture exercises will be scored by 80% and 20%, respectively.
Understanding of basics of ordinary differential equations is mandatory to pass the course.

●Notes

* No requirements.
* The class can be taken either in the lecture room or by on-demand style via NUCT.
* Question to the lecturers may be sent via NUCT using the "message" function.
* Discussion among students on the lecture may be performed via NUCT using the "message" function.

●Contacting Faculty

Questions are acceptable during and after the class. For other times, make appointment with the lecturer by phone or e-mail.
A-class: H. KondoTel: 052-747-6539, ext: 6539, e-mail: hkondo at nagoya-u.jp
B-class: K. Shiokawa Tel: 052-747-6419, ext: 6419, e-mail: shiokawa at nagoya-u.jp

Mathematics I and Tutorial B (1.5credits) (数学１及び演習Ｂ)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	Kazuo SHIOKAWA Professor	Hiroki KONDOH Associate Professor	Seiji KATAKURA Assistant Professor

●Course Purpose

To study vector analysis systematically and to understand the relation between physical phenomena and theories

1. To develop the ability of analyzing curves and surfaces using vector calculus
2. To develop the ability of analyzing scalar and vector fields (to understand gradient, divergence, rotation, line integral, and surface integral)

●Prerequisite Subjects

Elements of Mathematics I-IV
Elements of Physics I, II

●Course Topics

1. Parametric representation of curves and surfaces and their analysis
2. Scalar field and vector field, and their derivatives (gradient, divergence, rotation)
3. Line integral and surface integral
4. Gauss's theorem and Stokes's theorem
6. Summary and Evaluation

Practise class provides report subject every time.

●Textbook

Linear Algebra and Vector Calculus (Advanced Engineering Mathematics, 8th Edition) by E. Creyszig, translated by M. Hori, Baifukan Co., Ltd.

●Additional Reading

References will be provided in case if they are necessary.

●Grade Assessment

Evaluation is made on the basis of final examination (80%) and the performance in exercises (20%). In case if final examination is not held, evaluations of exercises and lecture excercises will be scored by 50% and 50%, respectively. Understanding of basics of vector analysis is mandatory to pass the course.

●Notes

No requirements.

●Contacting Faculty

Questions are acceptable during and after the class. For other times, make appointment with the lecturer by phone or e-mail.

A-class: H. KondoTel: 052-747-6539, ext: 6539, e-mail: hkondo at nagoya-u.jp
B-class: K. Shiokawa Tel: 052-747-6419, ext: 6419, e-mail: shiokawa at nagoya-u.jp

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 Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	"YOSHIDA Yutaka" Professor	Yuki Funabora Associate Professor	Masahito NOSE Associate Professor

●Course Purpose

Based on Mathematics 1 with Exercises, this lecture covers Laplace Transform, Fourier analysis and partial differential equations, which are important mathematical tools in engineering.In this lecture, mathematical way of thinking and applications to practical problems are stressed.

●Prerequisite Subjects

Elements of Mathematics I-V, Mathematics 1 with Exercises

●Course Topics

1.Laplace Transform
*Laplace transform/Inverse laplace transform
*Step function
*Delta function
*Convolution
2.Fourier Analysis
*Fourier series
*Fourier integral
*Fourier transform
3.Partial Differential Equations
Reports as homework are assigned in the lecture and its exercise.
*Wave Equation
*Heat Equation
* Rectangular Membrane

●Textbook

Advanced Engineering Mathematics, Erwin Kreyszig.

●Additional Reading

Introduce reference books during class as needed.

●Grade Assessment

Examinations and Reports,Against a full mark of 100, a mark of more than 60 is passing.

●Notes

No registration requirements required.
Questions to teachers are asked by the NUCT function "Message".
Exchange opinions between students regarding the class using the NUCT function "Message".

●Contacting Faculty

Students are encouraged to ask questions during and after lectures.
(Especially this year, questions about lectures will be accepted by the NUCT function "Message".)

Yoshida: yoshida@nuee.nagoya-u.ac.jp
Nosé: nose.masahito@isee.nagoya-u.ac.jp
Funabora: funabora@nagoya-u.jp

Probability Theory and Numerical Analysis with Exercises (3.0credits) (確率論・数値解析及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	"FUJII Toshiaki" Professor	Nozomu NISHITANI Associate Professor	Taku Nakajima Assistant Professor

●Course Purpose

We cultivate a better understanding on the fundamentals and application of the theory of probability, stochastic process and numerical analysis for students in electrical and electronics engineering.

In the end of the class, we can analyze the phenomenon to obey for probability, a stochastic process, and find a numerical solution using a computer for various mathematical problems.

●Prerequisite Subjects

Fundamental Computer Programing with Exercises

●Course Topics

1.Theory of Probability: *Probability space:*Random variables:*Moments:*Generating function and characteristic function:*Poisson process:*Markov process
2.Numerical Analysis: *Calculation error: *Numerical solution of simultaneous linear equations: *Curve fitting: *Numerical integration: *Numerical solution of non-linear equations: *Numerical solution of ordinary differential equations

●Textbook

●Additional Reading

●Grade Assessment

Examination and Report. Details will be described by each lecturer when the lecture begins.

●Notes

Knowledge of probability and statistics at the high school level
It is recommended to take "Fundamental Computer Programing with Exercises", but it is possible to take it even if you have not taken it.

Theory of Probability: Lectures will be given on demand video, and exercises will be conducted face-to-face or online via Teams. Details will be announced at NUCT.

Numerical Analysis: Lectures will be given on demand video, and exercises will be conducted face-to-face or online via Teams. Details will be announced at NUCT.

●Contacting Faculty

Details will be described by each lecturer when the lecture begins.

Theory of Probability: Students can communicate with their lecturer and TA during lecture hours or via email (fujii@nuee.nagoya-u.ac.jp).

Numerical Analysis: Students can communicate with their lecturer and TA during lecture hours or via email (n-ana@isee.nagoya-u.ac.jp).

Fundamentals of Electromagnetic Theory with Exercises (1.0credits) (電気磁気学基礎演習)

Course Type	Basic Specialized Courses		
Class Format	Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	Norihiko NISHIZAWA Professor	Masahiro NAGAO Associate Professor	Naoto KODAMA Assistant Professor

●Course Purpose

Exercise on electromagnetic theory, especially Magnetic field and Magnetic substance, Stationary current and Magnetic field caused by current

●Prerequisite Subjects

Electromagnetic theory I,Electromagnetic theory II

●Course Topics

1. Stationary current: Conservation law of charge: Ohm's law : Kirchhoff's law: Joule heat:2. Magnetic field caused by current: Ampere's law : Vector potential Biot-Savart's law : Force to current: Lorentz force : Magnetic Energy:3. Magnetic field and Magnetic substance: Magnet and magnetic pole: Magnetic field and magnetic dipole: Electric and magnetic quantity: Magnetic energy

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Programming with Exercises (3.0credits) (プログラミング及び演習)

Course Type	Basic Specialized Courses	
Class Format	Lecture and Exercise	
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering	
Starts 1	2 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	KoheiOGAWA Associate Professor	Takuro YONEZAWA Associate Professor

●Course Purpose

This series of lectures give the advanced computer programming techniques for solving various problems by learning computer programming in C languages through exercises. More specifically, students taking this course are expected to become capable of writing a relatively large program (about 500-1000 lines). Students are expected to cultivate basic skills such as information literacy as well as applications skills such as logical thinking and problem solving. Furthermore, creativity will be also fostered through designing program structures.

Objectives.
-To be able to logically design program components according to objectives and specifications
-To be able to implement an efficient program (C language) according to the design

●Prerequisite Subjects

Fundamental Computer Programming with Exercises

●Course Topics

1. Review exercises of pointer and composite type
2. Scope of variables, separate compilation, make
3. Basic use of shell command (pipe, redirect, etc.)
4. Program design technique (use of subroutines, code reuse, naming methods of variables, etc.)
5. Project exercises

Mid-term and Final-term project will be set. For the final-term project, each student should plan and create a program.
Mini quiz will be given in every lectures to increase understanding of C language.
Homework will be given every week to increase understanding of each lecture.

Please note that the classes will basically be delivered on demand. The first class and the last class will be held as live online classes. The details will be posted on the Electrical Engineering Bulletin Board later.

●Textbook

Textbook:
Norio Shiratori et.al. "C language" (Kyoritsu Publishing, 2014) ISBN: 978-4-320-12350-2

●Additional Reading

C () : ; (2018/2/16)
Will be introduced in the lecture as necessary.

●Grade Assessment

Evaluation will be based on:
- Mini quiz : 10%
- Homework: 50%
- mid-term and final project: 40%

In total, more than 60% is necessary to pass the class.

●Notes

Basic Programming (1st year fall semester)

●Contacting Faculty

During and after lectures/exercises

Electronics Circuits with Exercises (3.0credits) (電子回路工学及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	Noriyasu ONO Professor	Takeshi KATO Professor	HirohikoTANAKA Assistant Professor

●Course Purpose

This lecture is designed to learn basic knowledge of non-linear circuit components, such as diode and transistor, and theory of analog transistor circuits to build the amplifier and other functional circuits. This lecture assumes the students have studied Linear circuit with Exercises, and will be necessary to understand the courses of Digital Circuits with Exercises, Power Electronics, and Sensing System Engineering, as well as to conduct Experimental Laboratory of Electrical Electronic and Information Engineering.
After successfully studying this lecture, students will be able to:
1. Understand basic properties of non-linear circuit components, such as diode and transistor, and analyze the circuits using these components.
2. Describe the concept of signal amplification and demonstrate the hybrid transistor model.
3. Analyze and build power amplification circuits
4. Analyze frequency response of C-R coupled amplifier circuits and design the amplifiers with appropriate gain and bandwidth.
5. Analyze and build differential amplifier circuits.
6. Analyze and build negative feedback circuits and operational amplifier circuits.

●Prerequisite Subjects

Linear circuit with Exercises

●Course Topics

1 Diode and transistor
2, 3. Basic of amplification using transistor
4. Equivalent circuit based on hybrid transistor model
5. Input/output impedance and impedance matching of amplifier circuits
6. Transistor biasing circuits and their stability
7. FET amplification circuit
8. Power amplifiers
9. Direct-coupled amplifiers
10, 11. C-R coupled amplifiers
12. Negative feedback amplifiers
13. Operational amplifiers
14. Oscillators
15. Modulators and demodulators

Before leaning each topic in the lecture, students should read textbook pages corresponding to the topic. In the exercise, homework reports will be issued and collected a week later. In addition, students are encouraged to solve the example questions and chapter end problems in the textbook.

●Textbook

Gendai Denshi-Kairo(I): Yoshifumi AMEMIYA, Ohmsha, Ltd.

●Additional Reading

Additional text books may be introduced in the lecture.

●Grade Assessment

Evaluation will be based on the following weighting: Exercise (20%), Interim exam (40%), Final exam (40%). Grading policy is as follows A+: 95-100, A: 80-94, B: 70-79, C: 65-69, C-: 60-64. and F: 0-59.

●Notes

No requirements to take this course.

●Contacting Faculty

Questions will be answered via e-mail.
Students should contact to
Prof. Kato: kato.takesh.i6_at_f.mail.nagoya-u.ac.jp (please change _at_ to @)
or
Prof. Ohno: ohno_at_ees.nagoya-u.ac.jp(please change _at_ to @).

Electric Circuits with Exercise (3.0credits) (電気回路論及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	Takeyoshi KATOH Professor	Takayuki UMEDA Associate Professor	Jun IMAOKA Associate Professor

●Course Purpose

To understand transient phenomena in lumped-parameter and distributed-parameter circuits by utilizing conventional methods and the Laplace transform. To understand ac steady-state responses of distributed-parameter circuits. To acquire ability to understand various phenomena by utilizing equivalent circuit analysis.

<Objectives>

1. To correctly describe responses of lumped-parameter and distributed-parameter circuits with circuit equations.
2. To understand and to become able to explain steady-state and transient phenomena in the circuits.

●Prerequisite Subjects

Linear circuit with Exercises
Mathematics I and Tutorial A

It is recommended to take the following lectures simultaneously,
Mathematics II and Tutorial
Complex function theory

●Course Topics

1. Properties of electric circuits and circuit components
2. Solution of circuit equation, transient phenomena and steady state
3. Solution of circuit equation by utilizing Laplace transform
4. Impulse and step responses and their application
5. Properties and expression of networks
6. Properties of distributed-parameter circuit and basic equations
7. Transient Phenomena, steady state, reflection and transmission of traveling wave in distributed-parameter circuits
8. AC steady state and standing wave in distributed-parameter circuits

Students are requested to prepare for the next class and to submit the report on exercises provided in the previous class.

●Textbook

TEXT M. Hibino, Inter University Electric Circuit B (Ohmsha)

●Additional Reading

Text books on electric circuit will be introduced depending on the degree of students' understanding.

●Grade Assessment

Evaluation based on Examination and Reports

Entrance Year: 2020 or later
100 - 95:A+, 94 - 80:A, 79 - 70:B, 69 - 65:C, 64 - 60:C-, < 59:F
Entrance Year: 2019 or before

100 - 90:S, 89 - 80:A, 79 - 70:B, 69 - 60:C, < 59:F

●Notes

No condition is required.

●Contacting Faculty

After the lecture basically.

Address
lecturetkato@nuee.nagoya-u.ac.jp
taka.umeda@nagoya-u.jp
exercise imaoka@nuee.nagoya-u.ac.jp

Quantum Mechanics with Exercises (3.0credits) (量子力学及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	Akira FUJIMAKI Professor	Yutaka ONO Professor	Taro YAMASHITA Associate Professor
	Shotaro KITAJIMA Assistant Professor	Masamitsu TANAKA Assistant Professor	

●Course Purpose

Quantum mechanics is a basis for studying the natures of atoms or electrons which determine the characteristics of electrical materials such as metal, semiconductor, and insulator. In addition, the quantum theory is going to be applied also to computing and communication. The subject of this course is to study the basics of the quantum mechanics.

Objectives

1. To understand and explain the basic concept of the quantum mechanics.
2. To be able to carry out calculations using the Schroedinger equation.
3. To understand and explain the physical meanings.

●Prerequisite Subjects

Foundations of Mechanics I, II, Foundations of Electromagnetics I, II, Calculus I, II, Linear Algebra I, II, Complex Analysis

●Course Topics

1.Necessity of quantum mechanics, photoelectric effect
2.Electron diffraction, de Broglie wave
3.Wave mechanics, Schroedinger equation, wave function
4.Uncertainty principle, Ehrenfest theorem
5.Stationary state, free particle in a one-dimensional potential well
6.One-dimensional harmonic oscillator
7.Physical quantity and operator, principle of superposition
8.Commutation relation, Fourier series
9.Fourier series, delta-function
10.Phase velocity and group velocity, probability current density
11.Free particle in a box, tunnel effect
12.Schroedinger equation written in polar coordinates
13.Spherical surface harmonics, angular momentum operator
14.Hydrogen atom
15.Summary

●Textbook

S. Koide “Ryoshirikigaku (Quantum Mechanics) (I)” (Shokabo)

●Additional Reading

Reference will be introduced in class.

●Grade Assessment

Evaluation weights for the objectives above are even.

Evaluation is made on the basis of the examination and the report in exercises. Total score of 60 points ore more in 100 points is necessary to pass the course.

●Notes

Students are required to review the contents covered in the previous lecture before each class.
Classes will be on-demand, in-person, or online (live) classes over Zoom. The detailed schedule will be notified on NUCT.

●Contacting Faculty

Contact: Yutaka Ohno ext. 5387 yohno@nuee.nagoya-u.ac.jp
Masamitsu Tanaka ext. 3324 masami_t@nagoya-u.jp

Digital Circuits with Exercises (3.0credits) (ディジタル回路及び演習)

Course Type	Basic Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	Masaaki KATAYAMA Professor	Takaya YAMAZATO Professor	Takayoshi TSUTSUMI Assistant Professor

●Course Purpose

This lecture focuses on digital circuits, the crucial part of various equipment such as computers, signal processors, and machine controllers. Students learn how the electronic circuit expresses and processes information and basic knowledge on digital circuit design.

●Prerequisite Subjects

Electric Circuits with ExercisesElectronics Circuits with Exercises

●Course Topics

Analog and DigitalBasics of Bulean AlgebraBasics of Combinational CircuitsBasics of Sequential CircuitsDigital Circuit Devices COMS CircutisPopular Combinational CircuitsPopular Sequential CircuitsArithmetic CircuitMemory Devices

●Textbook

see Japanese syllabus

●Additional Reading

References will be announced before or during lectures. NUCT may be used for the announcements.

●Grade Assessment

Your final grade will be calculated according to the following process: the mid-term report (50%), the term-end examination (50%), and a fraction of reports for the assignments. To pass, students must earn at least 60 points out of 100.

●Notes

Prerequisite: NoneThe class will be partially real-time online (lectures/Exercise), and partially face-to-face in the classroom for touch-on exercises.

●Contacting Faculty

Questions in the class are welcome and encouraged.Questions just after the lecture are accepted if time allows.Students may send questions by messages of NUCTMeetings may be arranged if requested by emails.Questions about individual results may not be answered except for possible mistake in grading.

Information Theory (2.0credits) (情報理論)

Course Type	Basic Specialized Courses	
Class Format	Lecture	
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering	
Starts 1	3 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	kazuya takeda Professor	Hiroshi HASEGAWA Professor

●Course Purpose
Understanding mathematical formulations of information processing as a basis of reliable communication systems.

●Prerequisite Subjects
Mathematics I and Tutorial, Mathematics II and Tutorial, Probability Theory and Numerical Analysis with Exercises

●Course Topics
Each of the following topics will be studied through two-three lectures.

1. Representation of information and probability
2. Entropy
3. Source coding
4. Channel coding
5. Continuous information source
6. Communication systems

In order to fully understand the above topics, students are requested to check the corresponding part of the textbook before each lecture. Then, after the lecture, they are also requested to solve all the questions in the part and follow all the proofs of theorems there.

●Textbook
Fundamentals and applications of information theory (http://www.kindaikagaku.co.jp/bookdata/ISBN4-7649-2507-9.htm, in Japanese)

●Additional Reading
The textbook will be used throughout all lectures, however, related books on each topic will be announced whenever necessary.

●Grade Assessment
<For students whose entrance year to the university is 2020 or later>
Score/Grade : 100-95/A+, 94-80/A,79-70/B, 69-65/C, 64-60/C-, 59-0/F

<For students whose entrance year to the university is 2019 or earlier>
Score/Grade : 100-90/S, 89-80/A, 79-70/B, 69-60/C, 59-0/F

The ensemble averages of scores in mid-term and final tests determine the Scores/Grades.

●Notes
no special prerequisite is required

●Contacting Faculty
Questions and discussions are encouraged during classes and when they are necessary.

Experiments on Electrical Electronic and Information Engineering 1 (3.0credits) (電気電子情報工学実験第１)

Course Type	Specialized Courses		
Class Format	Experiment		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	3 Spring Semester		
Elective/Compulsory	Compulsory		
Lecturer	Kenji ISHIKAWA Professor	Keita Takahashi Associate Professor	Maki KUSHIMOTO Lecturer
	Haruka SUZUKI Lecturer	HirohikoTANAKA Assistant Professor	Masamitsu TANAKA Assistant Professor
	AkioOTA Assistant Professor	OSHIMA Daiki Assistant Professor	Emi KANO Assistant Professor
	Shotaro KITAJIMA Assistant Professor	Takayoshi TSUTSUMI Assistant Professor	Kosuke MURATE Assistant Professor
	Rei MIYATA Assistant Professor	Seiji KATAKURA Assistant Professor	BEN NAILA Chedlia Assistant Professor
	Chihiro TSUTAKE Assistant Professor	Kenta URANO Assistant Professor	

●Course Purpose

Students conduct experiments on Electrical Engineering, Electronics, and Information Engineering, and write reports. The purpose is that, through the experiments, students establish solid knowledge on Linear Circuits, Electric Circuits, Electronics Circuits, Information Theory, Electromagnetic Theory, and Digital Circuits, and develop planning, applying, and teamwork skills.

Students understand and are able to explain the themes in the experiments.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Experiments on Electrical Electronic and Information Engineering 2 (3.0credits) (電気電子情報工学実験第２)

Course Type	Specialized Courses		
Class Format	Experiment		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	3 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	Kenji ISHIKAWA Professor	Keita Takahashi Associate Professor	Hiroki KOJIMA Associate Professor
	Taro YAMASHITA Associate Professor	Muneaki KURIMOTO Associate Professor	Jun IMAOKA Associate Professor
	Masahito NOSE Associate Professor	Fujii keisuke Associate Professor	Masahiro NAGAO Associate Professor
	Yuki Funabora Associate Professor	Yojiro MORI Associate Professor	Maki KUSHIMOTO Lecturer
	Haruka SUZUKI Lecturer	HirohikoTANAKA Assistant Professor	Masamitsu TANAKA Assistant Professor
	Naoto KODAMA Assistant Professor	AkioOTA Assistant Professor	OSHIMA Daiki Assistant Professor
	Emi KANO Assistant Professor	Shotaro KITAJIMA Assistant Professor	Takayoshi TSUTSUMI Assistant Professor
	Kosuke MURATE Assistant Professor	Rei MIYATA Assistant Professor	Seiji KATAKURA Assistant Professor
	BEN NAILA Chedlia Assistant Professor	Chihiro TSUTAKE Assistant Professor	Kenta URANO Assistant Professor

●Course Purpose

For one of the themes related to Electrical Engineering, Electronics, and Information Engineering listed below, students propose a plan, conduct an experiment, and study and report the results. Autonomy and originality are expected.
The purpose is that, through the experiment, students experience the process of searching and solving problems, establish solid knowledge on the theme, and develop planning, applying, and teamwork skills.

Students understand and are able to explain the theme in the experiment.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Electromagnetic Theory with Exercises (3.0credits) (電気磁気学及び演習)

Course Type	Specialized Courses		
Class Format	Lecture and Exercise		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	2 Autumn Semester		
Elective/Compulsory	Compulsory		
Lecturer	Hirotaka TOYODA Professor	Takeyoshi KATOH Professor	Haruka SUZUKI Lecturer
	OSHIMA Daiki Assistant Professor		

●Course Purpose

To study systematic knowledge of electromagnetism as fundamentals of electrical and electronic engineering; the main subjects are electromagnetic induction, Maxwell's equations and electromagnetic waves.

Achievement

1. Understanding fundamental concepts of electromagnetism
2. Understanding various laws derived from fundamental concepts
3. Solving problems related to electromagnetism through exercises

●Prerequisite Subjects

Elements of electromagnetism Elements of Physics-I, -II

●Course Topics

1. Faraday's low of electromagnetic induction, self-inductance and mutual inductance
2. Magnetic energy
3. Force acting on electric circuits, skin effect
4. Displacement current
5. Maxwell's equations
6. Poynting vector
7. Wave equation
8. Reflection and refraction of electromagnetic waves, wave guide
9. Radiation of electromagnetic wave

●Textbook

Text H. Okubo et al; Electromagnetism (in Japanese) Prints for exercise

●Additional Reading

Many books on electromagnetism are available.

●Grade Assessment

Entrance Year: 2020 or later

10095:A+, 9480:A, 7970:B, 6965:C, 6460:C-, <59:F

Entrance Year: 2019 or before

10090:S, 8980:A, 7970:B, 6960:C, <59:F

Midterm examination (45%), examination (45%) and exercise reports (10%) for total evaluation (100%).

●Notes

Detailed information on lecture and exercise will be delivered by NUCT system.

●Contacting Faculty

After the lecture, or telephone/e-mail.

Address

Toyoda ext.4698 toyoda(at)nuee.nagoya-u.ac.jp,

Kato ext.5373 tkato(at)nuee.nagoya-u.ac.jp

Fundamentals of Electric Energy with Exercises (3.0credits) (電気エネルギー基礎論及び演習)

Course Type	Specialized Courses	
Class Format	Lecture and Exercise	
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering	
Starts 1	2 Autumn Semester	
Elective/Compulsory	Compulsory	
Lecturer	"YOSHIDA Yutaka" Professor	Hiroki KOJIMA Associate Professor

●Course Purpose

Based on basic specialized courses, e.g. electromagnetic theory and circuit theory, aim of this lecture is that students acquire an understanding of electric energy conversion, generation, and power transmission.
In this lecture, students will understand energy environment, thermodynamics in relation to heat engines, and basis of electric power transmission.

●Prerequisite Subjects

Fundamentals of Electromagnetic Theory, Linear Circuit, Thermodynamics

●Course Topics

1. Energy situation and the mutual conversion
2. Energy resources and the importance of electric energy
3. Thermodynamics (First law, Second law, Entropy, Carnot cycle, etc.)
4. Fundamentals of electric power transmission

Reports as homework are assigned in the lecture and its exercise.

●Textbook

●Additional Reading

Thermodynamics: An Engineering Approach, Y.A. Çengel and M.A. Boles, McGraw-Hill

●Grade Assessment

By examination and report, an understanding of energy environment, thermodynamics, and electric power transmission is evaluated. Against a full mark of 100, a mark of more than 60 is passing.

●Notes

No registration requirements are required.

●Contacting Faculty

Students are encouraged to ask questions during and after lectures.
Yoshida:yoshida@nuee.nagoya-u.ac.jp
Kojima: kojima@nuee.nagoya-u.ac.jp

Automata and Formal Languages (2.0credits) (オートマトンと形式言語)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	2 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Satoshi SATOH Professor

●Course Purpose

This is an introductory course on automata and formal languages, which is a foundation of computation and programming languages.

The goals of this course are to
1. be able to define an infinite set of strings by automata and formal grammars.
2. be able to obtain an infinite set of strings defined by automata and formal grammars.
3. be able to manipulate automata and formal grammars.
4. be able to understand and explain Turing Machines.
5. be able to understand and explain Chomsky hierarchy.

This course will be taught in Japanese.

●Prerequisite Subjects

Discrete Mathematics with Exercise
Fundamental Computer Programming with Exercises
Computer Programming with Exercises

●Course Topics

1. Regular languages
1.1 Finite-state automata
1.2 Regular grammars
1.3 Regular expressions
2. Context-free languages
2.1 Pushdown automata
2.2 Context-free grammar
3. Turing Machines
4. Chomsky hierarchy

Before each class, you should read the designated part of the textbook and identify what you do not understand. After each class, you should review what you studied. For assignments, you should submit reports.

●Textbook

Okadome Takeshi. Introduction of Automata and Formal Grammar (in Japanese). Morikita Publisher, 2015.

●Additional Reading

Alan P. Parkes. A Concise Introduction to Languages and Machines. Springer, 2008.

●Grade Assessment

The final grade will be calculated according to the submitted reports and the final examination.
You can pass this lecture if you understand the elemental knowledge about automata and language theory and can define, interpret, and manipulate them. You will get a higher grade if you can solve more difficult problems.

●Notes

No requirement for registration.

●Contacting Faculty

Students can ask questions via NUCT.

Electric Power Apparatus (2.0credits) (電力機器工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Yasunobu YOKOMIZU Professor

●Course Purpose

A lecture on the fundamental concepts and properties of electric power apparatuses such as transformers and machines.

Goal
1. To understand fundamentals on energy conversion.
2. To perform calculation on the basis of equivalent circuits.
3. To understand various phenomena related to electric power apparatus.

●Prerequisite Subjects

Linear Circuit with Exercises, Electric Circuits with Exercises

●Course Topics

1. Basic Concepts of Electromagnetic Phenomena
2. Principle of Transformer,
3. Equivalent Circuit and Properties of Transformer
4. Principle of Induction Motor, Equivalent Circuit of Induction Motor
5. Fundamental Properties of Induction Motor
6. Principle of DC Machines,
7. Fundamental Properties of DC Generator and DC Motor
8. Principle and Properties of Synchronous Machines

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Electric Power Transmission Systems (2.0credits) (電気エネルギー伝送工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Naoki HAYAKAWA Professor

●Course Purpose

Lecture on fundamental and practical technologies of electric power transmission and distribution.
Performance goal-%-
1. Understanding of electric power transmission system.
2. Understanding and calculation of electrical characteristics of transmission lines.
3. Understanding and explanation of operation and controle of T&D system.
4. Fault calculation of T&D system.

●Prerequisite Subjects

Linear Circuit with Exercises, Electric Circuits with Exercises, Fundamentals of Electric Energy

●Course Topics

1. Introduction of Electric Power Systems
2. Transmission, Substation and Distribution
3. Electrical Charactoristics of Transmission LInes
4. Operation and Control of T&D System
5. Overvoltage Phenomena in T&D System
6. Fault Calculation of T&D System
7. Stability of T&D System
8. DC Transmission System
9. Topics on T&D system

Students should make a preparation of next lectures for understanding the terms etc.

●Textbook

Text: Electric Power System Engineering
Author: Hitoshi Okubo, etc.
Publisher: Ohmsha
Year: 2008

●Additional Reading

Some books will be introduced in the lectures.

●Grade Assessment

Your final grade will be calculated according to the reports. To pass, students must earn at least 60 points out of 100. Term-end examination might be carried out according to the instruction of Nagoya University.

●Notes

●Contacting Faculty

nhayakaw(at)nuee.nagoya-u.ac.jp

Sensing System Engineering (2.0credits) (センシングシステム工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	"FUJII Toshiaki" Professor

●Course Purpose

This course provides a lecture on fundamentals and its applications of sensing technologies through understanding of mechanism of various sensors, conversion and processing of measurement data. Also, some system integration techniques based on sensing technologies are introduced.

The goals of this course are to
1. be able to understand and explain the mechanism of various sensors and processing of measurement data.
2. be able to propose an appropriate solutions for the specific problem.

This course is taught in Japanese.

●Prerequisite Subjects

Mathematics of Electrical and Electronic Engineering with Exercises
Linear Circuitry with Exercises
Electromagnetic Theory with Exercises
Electronics Circuits with Exercises
Information Circuit Engineering with Exercises

●Course Topics

1.Fundamental unit and fundamental quantity
2.Sensing quantity of object
3.Sensing quantity of status
4.Sensing materials
5.Conversion and processing of sensed data
6.Reliability and evaluation of sensed data

●Textbook

Introduction to Sensing Technology(CORONA Publishing Co.Ltd, Gen-ichiro Kinoshita, Akio Jistumori)

●Additional Reading

Hajimeteno Keisoku Kougaku (KODANSYA Publishing Co.Ltd, Shigeo, MINAMI,Ichiro Kimura, Tsutomu ARAKI) Sensing Technology (CORONA Publishing Co.Ltd, Tomohide Niimi), Measurement, Sensor Technology (OHM Publishing Co.Ltd, Yoshiaki Tadokoro)

●Grade Assessment

Midterm Report(40%), Final Report(60%).
Pass mark: 60/100.

●Notes

No requirement for registration.
Classes are basically face-to-face, but some classes may be conducted online.

●Contacting Faculty

During and after lectures.
Questions can be asked through NUCT Message.

Electromagnetic Wave Engineering (2.0credits) (電磁波工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Yoshizumi MIYOSHI Professor

●Course Purpose

A lecture on the antenna, receiver, transmission line, radiation and propagation of electromagnetic wave, and applications based on fundamental electromagnetic field equations.

The goal of this course are to
1. understand basic concept of propagation of electromagnetic wave based on the basic laws about electromagnetics,
2. understand basic characteristics about transmission line, antenna etc. and be able to explain physics behind such characteristics and perform simple calculation.

●Prerequisite Subjects

Electromagnetic theory with Exercises

●Course Topics

1. Radio wave engineering
 Brief description about this class and definition of each radio wave
2. Transmission line
 Distributed constant circuit, Smith Chart
3. Radiation of radio wave
 Plane waves and Poynting flux
4. Propagation of radio wave
 Refraction of radio waves and fading
5. Anntenna
 Antenna directivity and gain

Students should read the text book before the class.

●Textbook

Radio Wave Engineering; Saburo Adachi and Taiti Sato (Morikita-Syuppan)

●Additional Reading

Introduction of Electromagnetic wave engineering: Yoshiaki Nakano (Suuri Kougaku Sya)

●Grade Assessment

Based on two reports.
Report1: Distributed constant circuit and waveguide
Report2: Propagation of radio waves and refraction of radio waves

●Notes

Basic knowledge about electromagnetism is required.
Remote class using NUCT is planned.
Questions to the lecture are accepted via NUCT.
Students can discuss each other via NUCT.

●Contacting Faculty

If you have any questions, please feel free to ask the lecturer via NUCT.

Contact: Phone 6340, e-mail miyoshi at isee.nagoya-u.ac.jp (Institute for Space-Earth Environmental Research

Solid-state Electronics and Tutorial (3.0credits) (固体電子工学及び演習)

Course Type	Specialized Courses	
Class Format	Lecture and Exercise	
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering	
Starts 1	3 Spring Semester	
Elective/Compulsory	Compulsory	
Lecturer	Jun SUDA Professor	Kiichi NIITSU Associate Professor

●Course Purpose

The target of this lecture is studying chemical bonding in solids, crystal structures, electrons and phonons in solids, and transport phenomena to understand fundamental principles of electric and electronic devices. Exercising related problems improves understanding of them.

●Prerequisite Subjects

Quantum Mechanics and Exercise

●Course Topics

1. Introduction2. Atomic orbitals and molecular orbitals3. Chemical bonding in solids4. Structures of solid matter 5. Crystal structures and symmetry 6. Reciprocal lattice and diffraction 7. Free electron model 8. Phonon 9. Electron in solids 10. Semiconductor 11. Electron motion and transport phenomena 12. pn junction 13. Electron under magnetic fieldIt is required to read the text book in advance.

●Textbook

1. C. Kittel2. Lecture note (via NUCT)

●Additional Reading

Neil W. Ashcroft, N.David Mermin, Solid State Physics, Thomson Learning (1976), ISBN-10: 0030839939, ISBN-13: 978-0030839931

●Grade Assessment

Attendance of class, Exercises (50%) and examination (50%). For checking understanding of chemical bonding in solids, crystal structures, electrons and phonons in solids, and transport phenomena, some reports and examination is prepared.

●Notes

Lecture will be done in face-to-face style. Practice will be done both face-to-face and on-line (real-time) styles. NUCT is used for distribution of lecture materials, submission of assignments. Communication with the lecturers should be done with message function of NUCT.

●Contacting Faculty

encourage students to ask questions after lecture

Control Engineering (2.0credits) (制御工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 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

Digital Signal Processing (2.0credits) (ディジタル信号処理)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Keita Takahashi Associate Professor

●Course Purpose

In this course, the students will study digital signal processing as a basis for information and communication engineering. This class covers two important topics, frequency analysis and system analysis, which are indispensable as mathematical methods for various areas in information and communication engineering.

Achievements:
1. To understand mathematical bases of analog and digital signal processing and apply them to the problems in information and communication engineering
2. To analyze frequency responses of signals using Fourier transform and discrete Fourier Transform
3. To analyze discrete-time systems by using z-transform
4. To design FIR and IIR filters as applications of digital signal processing.

●Prerequisite Subjects

Linear Circuit with Exercises, Electric Circuits with Exercises.

●Course Topics

This class consists of 7 sections below.
1. Introduction to digital signal processing
2. Fourier series and Fourier transform
3. Sampling theorem
4. Discrete Fourier transform
5. Laplace transform and linear systems
6. Z transform and discrete-time linear systems
7. FIR filter and IIR fileter

Lecture slides are made available online. The students are expected to learn the material in advance to each class.

To deepen the understanding, this course includes
- short exercises (at each lecture)
- homework exercises (5 times during the semester)

●Textbook

Digital Signal Processing: Hagiwara Masafumi (Morikita Publishing Co., Ltd.)

●Additional Reading

Specified during the lectures when necessary.

●Grade Assessment

The evaluation is based on the score of the final exam. Homework exercises are added to the score. The details will be provided at the first class.

●Notes

No prerequisite.
Lectures are provided at the classroom.

See NUCT website for details.

●Contacting Faculty

Feel Free to ask questions during the lectures.
Use message function on NUCT to ask questions.
(ext.3642)
keita.takahashi<#>nagoya-u.jp
Replace <#> with an "at sign".

Plasma Physics and Engineering (2.0credits) (プラズマ工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Hirotaka TOYODA Professor

●Course Purpose

Basic processes of gas discharge, fundamental properties of plasma and their applications are reviewed. Purpose of this lecture is that the students can explain elementary processes and fundermental characteristics of of gas discharge and can use these knowledge for applcation of the plasma.

●Prerequisite Subjects

Electromagnetic Theory with Exercises 1,2, Engineering Mechanics with Exercises I,II

●Course Topics

1. Introduction
2. Microscopic Plasma 1 (Particle and collision)
3. Microscopic Plasma 2 (Inelastic collisions)
4. Macroscopic Plasma 1 (Fluid equations)
5. Macroscopic Plasma 2 (Basic properties)
6. Macroscopic Plasma 3 (Plasma contacting wall)
7. Appearance of Plasma (Gas breakdown)
8. Plasma Production 1 (DC discharge)
9. Plasma Production 1 (RF discharge)
10. Plasma Production 1 (Microwave discharge)
11. Plasma Application 1 (Etching)
12. Plasma Application 2 (Deposition)
13. Plasma Application 3 (Display)
14. Plasma Application 4 (Envilonment)
15. Summary

●Textbook

Plasma Electronics (in Japanese) by Hideo Sugai

●Additional Reading

●Grade Assessment

Evaluated by Examination

Entrance Year: 2020 or later
10095:A+, 9480:A, 7970:B, 6965:C, 6460:C-, <59:F
Entrance Year: 2019 or before
10080:A, 7970:B, 6960:C, <59:D

●Notes

No condition is required

●Contacting Faculty

Will be accepted after the class. ext 4698 toyoda@nuee.nagoya-u.ac.jp

Computer Engineering (2.0credits) (計算機工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Hideki ANDO Professor

●Course Purpose

The purpose of this course is that students study basic computer organization and understand the principle of computers to enable the design of computers. Students also study assembly language programming to understand computer instructions.
Goals of this course are as follows:
1. Students can explain the principle of computers.
2. Students can perform assembly language programming.
3. Students can design a simple computer.
4. Students can design arithmetic units.

●Prerequisite Subjects

Digital circuits with exercises, fundamental computer programming with exercises, and programming with exercises

●Course Topics

1. Principle of computers
 1.1 Basic computer organization
 1.2 Instructions and assembly language programming
 1.3 Evaluation and understanding of performance
 1.4 Design of single-cycle processors
2. Arithmetic
 2.1 Arithmetic logic units
 2.2 Multipliers
 2.3 Floating-point arithmetic

Homework is assigned every lecture. Turn in due is designated for each assignment.

●Textbook

D. A. Patterson and J. L. Hennessy, Computer Organization and Design : The Hardware/Software Interface, Morgan Kaufmann

●Additional Reading

Slide copies are handed out.
According to lectures, the instructor introduces reference books as needed.

●Grade Assessment

The degree of students' achievement is evaluated by the midterm examination (40%), final examination (40%), and homework (20%).
For each goal, if basic problems can be solved, a pass is given. If more difficult problems can be solved, a higher grade is given.

●Notes

1. Lecture format: face-to-face
2. Questions: during lecture, via email or online discussion after an appointment via email
3. Message exchanges among students: via message tool of the NUCT

●Contacting Faculty

Questions after each lecture are accepted at the class room. Questions are also accepted via email or an online discussion after an appointment via email.

E-mail: ando@nuee.nagoya-u.ac.j&#112

Vacuum Electronics (2.0credits) (真空電子工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Nobuyuki IKARASHI Professor

●Course Purpose

This course will present the fundamentals of the physics of electron beam generation and its control in a vacuum. Topics include the quantum physics and statistical physics of electron in solids, and the basics of electron optics. Methods of production and measurement of vacuum are also included.
The goal of this lesson is for the students to have the above knowledge and skills.

●Prerequisite Subjects

Electromagnetic theory, quantum mechanics

●Course Topics

1.Electrons in solids (Free electron gas, the density of states, Fermi-Dirac distribution, work function)
2.Electron emission (various types of electron emission, electron sources)
3.Electron optics (electrostatic lens, magnetic lens, aberration)
4.Vacuum (Kinetic theory of gases, generation and measurement of vacuum)
5.Electron beam applications (transmission electron microscopy, electron holography, etc)

Download lecture materials and read from NUCT.

●Textbook

No specific textbooks will be used.
Materials for all lectures will be uploaded.

●Additional Reading

●Grade Assessment

Reports and examinations. A passing mark is 60/100.

●Notes

Classes are basically face-to-face, but some classes may be conducted online.

●Contacting Faculty

Questions can be asked through NUCT Message.

Algorithms and Data Structures (2.0credits) (アルゴリズムとデータ構造)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Spring Semester
Elective/Compulsory	Elective
Lecturer	Satoshi SATOH Professor

●Course Purpose

This is an introductory course on algorithm and data structure, which is a foundation of programming.
The goals of this course are to
1. be able to understand and explain the concept of complexity
2. be able to design algorithms by using basic data structures
3. be able to understand and explain basic methods of algorithms
4. be able to implement programs by using appropriate data structures and methods

This course will be taught in Japanese.

●Prerequisite Subjects

Discrete Mathematics with Exercise
Fundamental Computer Programming with Exercises
Computer Programming with Exercises
Automaton and Formal Language

●Course Topics

1. Algorithm and Complexity
2. List, Heap, Hash, and Bucket
3. Recursive Call and Divide-and-Conquer
4. Graph Search
5. Dynamic Programming
6. Reduction Algorithms
7. Maximum Flow
8. String Matching
9. NP-Completeness and Approximation Algorithms

Before each class, you should read the designated part of the textbook and identify what you do not understand. After each class, you should review what you studied. For assignments, you should submit reports.

●Textbook

Koukichi Sugihara. Data Structure and Algorithms (in Japanese). Kyoritsu Syuppan, 2001.

●Additional Reading

Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, and SClifford Stein. Intruduction to Algorithms. Third Edition, MIT Press, 2009.

●Grade Assessment

The final grade will be calculated according to the submitted reports and the final examination.
You can pass this lecture if you understand the elemental knowledge about algorithms and data structures and can apply them to specific problems. You will get a higher grade if you can solve more difficult problems.

●Notes

No requirement for registration.

●Contacting Faculty

Students can ask questions vis NUCT.

Power Electronics (2.0credits) (パワーエレクトロニクス)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	YAMAMOTO Masayoshi Professor

●Course Purpose

Electrical and Electronics engineering have been attracted great interest from the automotive area, the aerospace area and industry application area in recent years. Nagoya university is located at Chukyo area which supports Manufacturing technologies and companies in Japan. Therefore, Nagoya university must support the Japanese manufacturing strategy. This lecture includes the idea of responsibility. Concretely, this lecture has analysis, exercise and construction of experimental setup using Electric Circuit, Control Engineering and Electromagnetics knowledge. Our lecture target is shown as follows;

1.You can understand and analyze the drive method of Power Semiconductor Devices using transient phenomena.
2.You can understand and analyze the Power Electronics Circuit using transient phenomena.
3.You can design inductor using Magnetic Circuit applied Electromagnetics.
4.You can analyze the Transfer function of Power Electronics Circuit using control engineering knowledge.
5.You can design the control stability of Power Electronics Circuit using control engineering knowledge.
6.You can learn not only Classroom lecture but also experimental setup of electric circuit design.

●Prerequisite Subjects

Linear circuit theory, Mathematics1, 2, Mathematics for electrical & electronic eng.,Electrical circuit, Electronic circuit, Electromagnetic theory

●Course Topics

Contents of lecture

1. Power electronics
1.1 Power electronics applications
1.2 Basic knowledge of power semiconductor devices
1.3 Power electronics circuit
1.4 How to drive the power semiconductor device
2. Control of power electronics
2.1 Bode plot
2.2 Relationship between power electronics and bode plot
2.3 Control stability of power electronics
2.4 PWM control
2.5 Control design method of power electronics
3. Design of power inductor
3.1 Inductor of power electronics
3.2 Principle of magnetic circuit
3.3 Design method of Inductor
4. Power electronics applications
4.1 Power electronics system of MODEL S/TESLA
4.2 Power electronics system of MODEL 3/TESLA
4.3 Power electronics system of LEAF/ NISSAN

4.4 Power electronics system of EA (Electric Aircraft)

Submit the report for the assignment due at the end of lecture.

●Textbook

Print distribution as appropriate.

●Additional Reading

Print distribution as appropriate.

●Grade Assessment

Evaluation based on Examination and Reports

Entrance Year: 2020 or later
100 - 95:A+, 94 - 80:A, 79 - 70:B, 69 - 65:C, 64 - 60:C-, < 59:F
Entrance Year: 2019 or before
100 - 90:S, 89 - 80:A, 79 - 70:B, 69 - 60:C, < 59:F

●Notes

No course requirements.
Classes are conducted face-to-face and remotely (on-demand type). Remote learning is conducted at NUCT.
If you have any questions about the faculty, please email me.
Exchange of opinions between students regarding class members should be done using the NUCT function "Message".

●Contacting Faculty

Questions about the class will be accepted by email.

m.yamamoto@imass.nagoya-u.ac.jp

Dielectric Engineering (2.0credits) (誘電体工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Kenji ISHIKAWA Professor

●Course Purpose

1. The physical properties of dielectrics, their electrical properties, and optical properties from atomic, molecular-level physics, chemical behaviors, their fundamentals, application skills in physical properties and device engineering are able to be obtained.2. As a new application of dielectrics, students will be able to learn about the development of memory devices, state-of-the-art nano capacitors, sensors for IOT, biodevices, plasma medicine and agriculture.3. Creativity and comprehensive ability to view the next generation of electronics, photonics, and bioelectronics from both the material and system perspectives are able to be obtained

●Prerequisite Subjects

Electromagnetic theory and Solid State Electronics

●Course Topics

1. Material composition and dielectric 2. Polarization of dielectrics(polarization mechanism, polarization and absorption) 3. Ferroelectric substance(spontaneous polarization and domain structure, piezoelectric, pyroelectric and electrostriction phenomena) 4. Dielectric breakdown, deterioration and plasma 5. Characteristics of frequency 6. Application to ULSI and biomimetic devices 7. Application to bio and medicine 8. Application of sensor, actuator and IoT 9. Future prospective 10. Summary and evaluationAfter lecture, it is necessary to confirm the knowledge using book and notebook, solve some problems and submit the report.

●Textbook

Introduction of text book and distribution of materials in the lecture.

●Additional Reading

Introduction of the paper and materials in the lecture.

●Grade Assessment

Your final grade will be calculated according to the following process: Report (30%), term-end examination (70%). To pass, students must earn at least C grade or at least 60 points out 100.

●Notes

No requirements are required.Classes will be conducted both face-to-face and remotely (interactive distance education or on-demand). Remote classes will be conducted via NUCT.Questions to the instructor shall be sent via the NUCT "message" function in the case of on-demand.The exchange of opinions among students regarding the class shall be conducted through the NUCT function "Message" in the case of on-demand.

●Contacting Faculty

If you have any questions about the class, you can ask them through the NUCT function "Message" as described above.Faculty member in charge: Masaru HoriContact person: Masaru Hori, hori@nuee.nagoya-u.ac.jp.

High Voltage Engineering (2.0credits) (高電圧工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Naoki HAYAKAWA Professor

●Course Purpose

Lecture on fundamental and practical technologies of discharge mechanisms and characteristics in electrical insualting materials and high voltage power apparatus.

Performance goal:
1.Understanding and calculation of electric field distribution under high electric field
2.Understanding of discharge mechanisms in electrical insualting materials
3.Understanding of electrical insulation techniquies for high voltage power apparatus
4.Understanding and calculation of high voltage generation and measurement

●Prerequisite Subjects

Electromagnetic Theory with Exercises 1,2,Linear Circuit with Exercises

●Course Topics

1.Fundamentals of high voltage engineering and high electric field phenomena
2.Electric field analysis
3.Electrical insulating materials
4.Discharge characteristics in gas
5.Discharge characteristics in vacuum
6.Discharge characteristics in liquid
7.Discharge characteristics in solid
8.Electrical insulation of high voltage electric power apparatus (transformers, GIS, cables, etc)
9.Insulation coordination
10.High voltage generation and measurement

Students should make a preparation of next lectures for understanding the terms etc.

●Textbook

distribution of handout

●Additional Reading

Some books will be introduced in the lectures.

●Grade Assessment

Your final grade will be calculated according to the reports. To pass, students must earn at least 60 points out of 100. Term-end examination might be carried out according to the instruction of Nagoya University.

●Notes

●Contacting Faculty

nhayakaw(at)nuee.nagoya-u.ac.jp

Semiconductor Electronics (2.0credits) (半導体工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Hiroshi AMANO Professor

●Course Purpose

In this lecture, first, the role of semiconductor devices on the infrastructure is discussed.
Then, based on electromagnetic and quantum mechanics, energy band structure, statistics, junctions, and carrier transport are discussed.
After that, based on these fundamentals, principles of amplification, emission, and absorption of light are understood.
The goal of this lecture is as follows;
1. To understand the carrier transport and scattering process
2. To understand the carrier transition process
3. To grasp the ability to explain how to improve the performance of transistors, light-emitting diodes, laser diodes, and photovoltaics

●Prerequisite Subjects

Quantum mechanics and Exercises, Electromagnetic, Solid State Electronics and Exercises

●Course Topics

1Introdunction Role of semiconductor devices in the infrastructure, Crystal and crystal growth, device process, Introduction of software elemental semiconductor and compound semiconductor
2Chapter 1 Introduction to quantum mechanics, Fermi's golden rule
3Chapter 2 Formation of energy band in a solid, Fundamentals of pseudo potential method
4Chapter 3 Statistics in semiconductors
5Chapter 4 Donor and acceptor, Diffusion current and drift current, Scattering mechanism
6Chapter 5-1 Formation of pn junction
7Chapter 5-2 Origin of rectifying behavior, Mechanism of reverse current
8Chapter 6 Metal semiconductor junction, Schottky and Ohmic, Hetero junction
9Chapter 7 Bipolar transistor, Heterojunction bipolar transistor
10. Chapter 8 MOSFET, High electron mobility transistor
11. Chapter 9 Light matter interaction in a solid, Radiative and non radiative recombination
12. Chapter 10 Physics of light emitting diode
13. Chapter 11 Physics of laser diode and photovoltaics
14, Chapter 12 Physics of Thermoelectric device and quantum device
15. Summary of this lecture and final exam

Before each class, lecture note of each class which can be downloaded from NUCT should be carefully read.
After each class, exercises performed at each class should be reviewed.

●Textbook

Lecture note will be used as a text book.

Lecture note for each lesson is uploaded at NUCT. Download it for each class.

●Additional Reading

As a standard and well known textbook, ”S. M. Sze and K. K. Ng. Physics of Semiconductor Devices, Third Edition, Wiley- Interscience” is one of the best.

●Grade Assessment

The credit are given based on the following targets.
1. To understand the carrier transport and scattering process
2. To understand the carrier transition process
3. To grasp the ability to explain how to improve the performance of transistors, light emitting diodes, laser diodes, and photovoltaics

Evaluation is done based on the final examination (80%) and report(20%).
If students are having higher skills in the field of semiconductor engineering, they can get higher score.

●Notes

It is preferable that the students took the Solid State Electronics and Exercises class.
The class will be generally performed on-demand. Upon necessary, face-to-face class will be conducted.
The style of the class will be informed through NUCT.
Questions from students will be accepted through NUCT or e-mail. Please do not hesitate to ask questions.

●Contacting Faculty

Web page of lecture note will be announced through NUCT or bulletin board.

E-mail address; amano@nuee.nagoya-u.ac.jp
Office; C-TECs 6Floor Room 610 (Appointment is necessary.)

Magnetic Materials (2.0credits) (磁性体工学)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Takeshi KATO Professor

●Course Purpose

This lecture is designed to learn basic knowledge of physical properties of magnetic materials and application to the field of electrical engineering. This lecture assumes the students have studied Electromagnetic Theory with Exercise, Quantum Mechanics with Exercise, and Solid-state Electronics and Tutorial.

After successfully studying this lecture, students will be able to:

1. Understand magneto-static phenomena and describe basic magnetic measurement techniques.
2. Understand the physics of atomic magnetic moments and describe the difference of the magnetic orders, such as paramagnetism and ferromagnetism.
3. Understand the concepts of magnetic anisotropy, magneto-striction, and magnetic domain wall.
4. Understand the technical magnetization properties of ferromagnetic materials.
5. Describe various applications of magnetic materials.

●Prerequisite Subjects

Electromagnetic Theory with Exercises, Quantum Mechanics with Exercises, Solid-state Electronics and Tutorial

●Course Topics

1. Magneto-static phenomena
2. Magnetic measurement techniques
3. Atomic magnetic moment
4. Exchange interaction and various magnetic orders
5. Magnetic anisotropy
6. Magneto-striction
7. Magnetic domain wall and domain structure
8. Technical magnetization properties of ferromagnetic materials
9. Magnetization Dynamics
10. Various applications of magnetic materials

Before learning each topic in the lecture, students should read handout pages corresponding to the topic. Several homework reports will be issued, and corrected a week later.

●Textbook

No required text book for the course, and daily outlines will be posted for download.

●Additional Reading

Physics of magnetism, S. Chikazumi, Oxford University Press Inc, New York

●Grade Assessment

Evaluation will be based on the following weighting: Reports (20%), Final exam (80%). Grading policy is as follows A+: 95-100, A: 80-94, B: 70-79, C: 65-69, C-: 60-64, and F: 0-59.

●Notes

No requirements to take this course.

●Contacting Faculty

Questions will be answered via e-mail.
Students should contact to Prof. Kato
kato.takeshi.i6_at_f.mail.nagoya-u.ac.jp (please change _at_ to @).

Optical Electronics (2.0credits) (光エレクトロニクス)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Norihiko NISHIZAWA Professor

●Course Purpose

In this course, we learn the elements of optics as the basics of optical electronics. We also study principles, characteristics, and applications of lasers.
The final destination:
1. To learn basic concept of optics
2. To understand principle and chracteristics of lasers
3. To understant the laser control technology and applications

●Prerequisite Subjects

Electromagnetic Theory, Quantum Mechanics

●Course Topics

We study about one chapter for each class.

Introduction How to study Opto-electronics
Chapter 1 Light as electro-magnetic wave
Chapter 2 Light propagation and optical waveguide
Chapter 3 Photon
Chapter 4 Principle of lasers
Chapter 5 A variety of light sources
Chapter 6 Semiconductor laser
Chapter 7 Optical detection (1)
Chapter 8 Optical detection (2)
Chapter 9 Light in anisotropic material
Chapter 10 Optical control (optical modulator, wavelength conversion)
Chapter 11 Application of optics (optical communication, optical display, laser processing)
Chapter 12 Micro-optical devices

The text should be read before the class. The problems in text should be solved after the class.

●Textbook

Opto-electronics, T. Jinbo et al, (Ohmsha)

●Additional Reading

Photonics, 6th edi., A. Yariv, Oxford

●Grade Assessment

The level of achievement is examined through the mini-test and final exam. The fundamental problem of this course should be solved accurately. The additional score is given if the high-level problem is solved.

●Notes

There is no requirement for registration.
Class is held by on-demand style using NUCT.
Please use the function of "Message" on NUCT to ask questions to the teacher.
Please use the function of "Message" on NUCT for discussion among students.

●Contacting Faculty

As written above, the questions are accepted via "Message" function on NUCT.

The professor in charge of this class; Norihiko Nishizawa
Email address; nishizawa@nuee.nagoya-u.ac.jp

Electronic Device Engineering (2.0credits) (電子デバイス工学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering	
Starts 1	3 Autumn Semester	
Elective/Compulsory	Elective	
Lecturer	SeiichiMIYAZAKI Professor	Yutaka ONO Professor

●Course Purpose

The evolution of electronics is indubitably based on the advancement of electron devices with higher performance and higher functionality. In this lecture, operation principles of widely-used electron devices, mainly semiconductor devices, and resulting fundamental device performances will be explained in a simple but valuable framework using energy band diagram.

Achievement target:
1. Understand and explain energy band diagrams.
2. Understand and explain device operating principles.

●Prerequisite Subjects

Fundamentals of Electronic Materials, Solid State Electronics, Semiconductor Engineering

●Course Topics

1.Historical Background, Current Status and Future Prospects of Electron devices
2.Energy Band Diagram and Electronic Properties of Materials (Metals, Semiconductors, Dielectrics)
3.PN Juction Devices
 Energy Band Diagram of MOS Capacitors and Fundamental Properties
 Zener Diodes, Tunnel Diodes
 Bipolar Transistors, Thyristors
4.MOS Devices
 Energy Band Diagram of MOS Capacitors and Fundamental Properties
 MOS Field Effect Transistors(MOS FETs), CMOS Transistors
5.High Frequency Devices
 Schottoky Junction Devices, Heterojunction Devices
6.Quantum Effect Devices
 Resonant Tunneling Transistors, Nanostructured Devices

As practice problem(s) will be assigned during and/or after class, your answer or response should be submitted as a brief report in each time or by the designated date.

●Textbook

Selected materials for each lecture will be distributed.

●Additional Reading

Semiconductor devices: physics and technology, SM Sze - 2009 - Wiley

Physics of Semiconductor Devices 3rd Edition,
Eds. Simon M. Sze , Kwok K. Ng - Wiley

●Grade Assessment

The achievements of the above objectives are equally measured.
In addition to scores of midterm and final exams, evaluations based on quizzes in each lecture, drills and reports will be made for overall rating.

The credit of this class is given if both basic physical properties of semiconductors and operation principles of semiconductor devices can be explained in connection with energy band diagram. The understanding levels of both fundamental characteristics of semiconductor devices and issues for their practical use are reflected in the evaluation score.

●Notes

There are no limitations for taking this course.
Lectures will be given face-to-face basically, but if necessary both face-to-face and remotely (on-demand via NUCT or live over Zoom).

*In changing the lecture style, it will be announced through the NUCT website.

●Contacting Faculty

For questions after each lecture, the message function of the NUCT should be used.
Before registration, please contact the following e-mail addresses:
miyazaki@nuee.nagoya-u.ac.jp, yohno@nagoya-u.jp

Computer Architecture (2.0credits) (計算機アーキテクチャ)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Hideki ANDO Professor

●Course Purpose

The purpose of this course is that students study high-performance computer organizations, based on those studied in the computer engineering course, to enable the design of computers. In particular, this course focuses on pipelining, instruction scheduling, and branch prediction. Students also study memory hierarchy such as caches, main memory, and virtual memory.
Goals of this course are as follows:
1. Students can understand and explain the computer organization for high performance.
2. Students can understand and explain the memory hierarchy.

●Prerequisite Subjects

Computer Engineering

●Course Topics

1. Basics of gate delay
2. Pipelining
 2.1 Basics
 2.2 Pipeline hazards
 2.3 Interlock
 2.4 Instruction scheduling
 2.5 Branch prediction
3. Memory hierarchy
 3.1 Caches
 3.2 Main memory
 3.3 Virtual memory
4. Exception handling

Homework is assigned every lecture. Turn in due is designated for each assignment.

●Textbook

Patterson and Hennessy, Computer Organization & Design, the Hardware/Software Interface, Morgan Kaufmann

●Additional Reading

J.L.Hennessy and D.A.Patterson, Computer Architecture, A Quantitative Approach, Morgan Kaufmann

●Grade Assessment

The degree of students' achievement is evaluated by the midterm examination (40%), final examination (40%), and homework (20%). For each goal, if basic problems can be solved, a pass is given. If more difficult problems can be solved, a higher grade is given.

●Notes

1. Lecture format: face-to-face
2. Questions: via email or online discussion after an appointment via email
3. Message exchanges among students: via message tool of the NUCT

●Contacting Faculty

Questions after each lecture are accepted at the class room. Questions are also accepted via email or an online discussion after an appointment via email.

E-mail: ando@nuee.nagoya-u.ac.j&#112

Wireless Communication Systems (2.0credits) (無線通信方式)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Masaaki KATAYAMA Professor

●Course Purpose

This lecture has learned fundamental theories supporting communication systems, network structures, and basic technologies in practical systems. The lecture aims to develop the basic knowledge in electrical and electronic engineering and the ability to apply the knowledge to a variety of problems. The language used in the class is Japanese.

●Prerequisite Subjects

Mathematics 2 with Exercises
Information Theory

●Course Topics

Basics of Wireless Communication Systems
Deterministic Signal Waveform and Spectrum
Analog Modulations
Autocorrelation Function and Spectrum
Digital Modulations including ASK, PSK, QAM, FSK, MSK and OFDM

Home works are given at almost every time.
The ansewers are given by NUCT.

●Textbook

New Inter-University Musen-Tuusin-Koogaku Ohmsha 2009. (Japanese)

●Additional Reading

Proakis: Digital Communications, McGraw Hill Also Lecture-notes at Nagoya University Open Course Ware site may be helpful.http://ocw.nagoya-u.jp/index.php?lang=en&mode=c&id=47&page_type=index

●Grade Assessment

Your final grade will be calculated according to the following process: the mid-term report (50%), the term-end examination (50%), and a fraction of reports for the assignments, which are eligibility requirements for the term-end examination.
To pass, students must provide correct answers at least 60 % of exams.

●Notes

prerequisite: None
Real-time online lecture (Zoom)

●Contacting Faculty

Questions in the class are welcome and encouraged. (Zoom Chat)
Students may send questions by NUCT Message.
supplementary material will be provided by NUCTNagoya University Collaboration and course Toolshttps://ct.nagoya-u.ac.jp/

Questions about individual results may not be answered except for possible mistake in grading.

Electric Energy Conversion Engineering (2.0credits) (電気エネルギー変換工学)

Course Type	Specialized Courses	
Class Format	Lecture	
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering	
Starts 1	4 Spring Semester	
Elective/Compulsory	Elective	
Lecturer	Mikimasa IWATA Designated Professor	Associated Faculty

●Course Purpose

After survey of issues related to the safety, energy security, economy, and environmental conservation of energy resources, generation, transportation and storage of electric energy will be studied. Thereby, students can master the basics power about the electrical energy. Moreover, students will have the ability to discuss next-generation electric power energy systems for realizing a sustainable development and a low-carbon society that must be developed in the future.

The goal of this lecture is to enable students to:
1. Understand conversion principle into electric energy from other energies.
2. Understand basic and state-of-the-art technologies on electric energy conversion.
3. Investigate, present and discuss next-generation electric power energy systems.

●Prerequisite Subjects

Fundamentals of Electric Energy, Electric Power Transmission Systems

●Course Topics

1. Status and problems of energy resources (Lectures twice)
2. Energy and environment (Lectures twice)
3. Principle of generator
4. Thermodynamics and principle of thermal power generation
5. Nuclear energy utilization
6. Mechanical energy and Principle of hydro power generation
7. Power generation system using renewable energy (Lectures twice)
8. Transmission of electric energy (Lectures twice)
9. Storage of electric energy
10. Other electric energy conversion
11. Tour of actual facilities related to electrical energy generation, transportation and storage technologies

The documents of the online lectures will be uploaded onto the NUCT by the dates shown in advance. Please take these online lectures, and submit your report by the dates shown in advance. Students are considered to have taken the lectures by submitting the report.

●Textbook

New Interuniversity - Electric Energy Introduction, Edited by Masayuki Yoda, Ohm-Company

●Additional Reading

Students will be notified if necessary.

●Grade Assessment

Each reports are required. Each reports are made 50-point full marks, and a term-end examination is made 50-point full marks. A total point is used for evaluation. 60 or more totaling points are considered as passing.

●Notes

No additional course requirements.
The lectures will be conducted in online lectures (on-demand type) by the NUCT.

Please ask questions to teacher using the NUCT function "Message".
Exchange of opinions regarding the lectures among students will be conducted using the NUCT function "Message".

●Contacting Faculty

As mentioned above, questions about the lectures are accepted by the NUCT function "Message".
Teacher contact information:
Shigeyuki Sugimoto, extension 2098, s.sugimoto@imass.nagoya-u.ac.jp

Communication Networks (2.0credits) (情報ネットワーク)

Course Type	Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	3 Autumn Semester
Elective/Compulsory	Elective
Lecturer	Nobuo KAWAGUCHI Professor

●Course Purpose

The purpose of this course is to describe various basic technologies that are used to create present information transport networks. The state of the art technologies and their major applications are also presented. The goals of this course are to obtain fundamental knowledge of the networks, and to gain an ability to apply the knowledge about current issues and directions of networks.

In the end of the course, the following knowledge and abilities are required.
1. Fundamental knowledge of Information Networks
2. Knowledge of specific network examples
3. Fundamental ability of understanding networks
4. Ability of applying the knowledge about current issues and directions of networks

●Prerequisite Subjects

Basic knowledge of Computer Programming is required.

●Course Topics

1. Present network architecture and bottleneck
2. Introduction to communication networks
3. Basics of queuing theory
4. Hierarchical network architectures and communication protocols
5. Wireless Networks
6. Basics of Internet
7. Network Applications

Assignments will be made for some classes.
Follow the order of assignments.

●Textbook

No specific textbooks will be used. Necessary documents will be provided
b the NUCT.

●Additional Reading

Advances in Transport Network Technologies -Photonic Networks, ATM and SDH -, by Ken-ichi Sato, Artech House, 1996
High speed networksM. BoisseauWiley

●Grade Assessment

Evaluated with the term end examination. Evaluation criteria are as follows.

(students from 2020)
100-95;A+94-80; A 79-70; B69-65;C64-60;C-, below 59; F

(students before 2019)
100-90; S, 89-80; , 79-70; B, 69-60; C, below 59; F.

●Notes

There is no prerequisites.

Tools:
We use Zoom for on-line lecture. We also use pre-recorded video.

Q&A:
We always welcome questions and discussions within on-line lectures.
Also, you can use NUCT for questions and comments.

●Contacting Faculty

Questions and discussions are encouraged during classes, and will be accepted anytime through NUCT when necessary.

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

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

●Course Purpose

The purpose of this course is to cultivate the applied skills that can be applied to engineering by utilizing the contents of lectures taken in this department through research on the tasks given in each laboratory you are assigned, by learning how to proceed with research, organize data, and make presentations.By taking this course, you will be able to:1. You can learn how to proceed with research for a given task, how to organize data, and how to present.2. You can use the content of the lectures you have taken to solve given tasks

●Prerequisite Subjects

Classes taken in the third year of this department

●Course Topics

Research on a given research theme.At that time, if necessary, a literature search and its consideration are expected. In addition, perform some computer simulations and experiments for evaluate the contents and the your ideas.Read textbooks and documents in related fields to facilitate research on your own. In addition, discussions on the contents of the your research will be conducted as appropriate. Therefore, the contents should be organized and compiled according to the progress of the research.

●Textbook

Specified when necessary.

●Additional Reading

Specified when necessary.

●Grade Assessment

Evaluate the degree of achievement for achievement goals based on daily research reports, presentations, and research results. Pass if the goal is achieved.

●Notes

Have credits to start the graduation research.

●Contacting Faculty

Staffs in your lab will answer your questions appropriately.

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

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

●Course Purpose

The purpose of this course is to cultivate the applied skills that can be applied to engineering by utilizing the contents of lectures taken in this department through research on the tasks given in each laboratory you are assigned, by learning how to proceed with research, organize data, and make presentations.By taking this course, you will be able to:1. You can learn how to proceed with research for a given task, how to organize data, and how to present.2. You can use the content of the lectures you have taken to solve given tasks

●Prerequisite Subjects

Classes taken in the third year of this department

●Course Topics

Research on a given research theme.At that time, if necessary, a literature search and its consideration are expected. In addition, perform some computer simulations and experiments for evaluate the contents and the your ideas.Read textbooks and documents in related fields to facilitate research on your own. In addition, discussions on the contents of the your research will be conducted as appropriate. Therefore, the contents should be organized and compiled according to the progress of the research.

●Textbook

Specified when necessary.

●Additional Reading

Specified when necessary.

●Grade Assessment

Evaluate the degree of achievement for achievement goals based on daily research reports, presentations, research results, graduation theses and graduation thesis presentations. Pass if the goal is achieved.

●Notes

Have credits to start the graduation research.

●Contacting Faculty

Staffs in your lab will answer your questions appropriately.

Electrical Engineering and Communication Laws (2.0credits) (電気及び通信法規)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	4 Autumn Semester		
Elective/Compulsory	Elective		
Lecturer	Part-time Faculty	Part-time Faculty	Part-time Faculty

●Course Purpose

To acquire knowledges necessary for radio workers licence and cheif electrical engineers licence, by learning effects and essentialities related to laws and regulations of electricity and communications.

●Prerequisite Subjects

None

●Course Topics

1.History of the Electrical Enterprise and the Electricity Enterprises Act 2.Public Utility Law 3.Electric Equipment Standard. 4.Laws for Electric Equipment Maintenance. 5.Laws for Atomic Energy 6.International Telecommunications Treaty 7.The Wireless Telegraphy Act,The Broadcast Act. 8.The Wire Telecommunications Act.

●Textbook

Hand out during class.

●Additional Reading

Introduced during class as needed.

●Grade Assessment

Report or Examination

●Notes

●Contacting Faculty

During the class.

Design and Drawing of Electric Machines (2.0credits) (電気機械設計法及び製図)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	4 Autumn Semester		
Elective/Compulsory	Elective		
Lecturer	Part-time Faculty	Part-time Faculty	Part-time Faculty

●Course Purpose

To understand fundamental principles of electrical equipment through its design.
To learn design-method fundamentals for reliabilities and life durations.

●Prerequisite Subjects

●Course Topics

1.Outline of design and drawing 2.Electrical design 3.Mechanical design 4.CAD,CAM,CAE
5.Applications 6.Design and Drawing Exercises

●Textbook

●Additional Reading

●Grade Assessment

Report or Examination

●Notes

●Contacting Faculty

Topics in Electrical Electronic and Information Engineering 1 (2.0credits) (電気電子情報工学特別講義第１)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	3 Autumn Semester		
Elective/Compulsory	Elective		
Lecturer	Part-time Faculty	Part-time Faculty	Part-time Faculty

●Course Purpose
Instructors who are active in each field will give lectures on research and development trends in electrical engineering, electronic engineering, and information and communication engineering, with the aim of cultivating applied skills, creativity and comprehensive skills.The purpose of this course is to learn the appeal of research and development in this field and to reflect it in future courses and research.

●Prerequisite Subjects
No specific requirements.

●Course Topics
Each time, lecturers who are active in related field will introduce the latest research and development contents.Before each lecture, check the web page about the company to which the lecturers belongs. After the lecture, a report will be imposed every time, so submit the contents that you understood.

●Textbook
Textbooks are not specified, but some materials will be distributed as needed.

●Additional Reading
Some books will be introduced in the lecture.

●Grade Assessment
Evaluation will be based on the submitted report.Pass if the goal is achieved

●Notes
No specific requirements

●Contacting Faculty
Each lecturer will answer your questions during the break time after the lecture.

Topics in Electrical Electronic and Information Engineering 2 (1.0credits) (電気電子情報工学特別講義第２)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	4 Spring Semester		
Elective/Compulsory	Elective		
Lecturer	Part-time Faculty	Part-time Faculty	Part-time Faculty

●Course Purpose

Instructors who are active in each field will give lectures on research and development trends in electrical engineering, electronic engineering, and information and communication engineering, with the aim of cultivating applied skills, creativity and comprehensive skills.The purpose of this course is to learn the appeal of research and development in this field and to reflect it in future courses and research.

●Prerequisite Subjects

No specific requirements.

●Course Topics

Each time, lecturers who are active in related field will introduce the latest research and development contents.Before each lecture, check the web page about the company to which the lecturers belongs. After the lecture, a report will be imposed every time, so submit the contents that you understood.

●Textbook

Textbooks are not specified, but some materials will be distributed as needed.

●Additional Reading

Some books will be introduced in the lecture.

●Grade Assessment

Evaluation will be based on the submitted report.Pass if the goal is achieved

●Notes

No specific requirements

●Contacting Faculty

Each lecturer will answer your questions during the break time after the lecture.

General Mechanical Engineering (2.0credits) (機械工学通論)

Course Type	Related Specialized Courses
Class Format	Lecture
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering
Starts 1	4 Spring Semester
Elective/Compulsory	Elective
Lecturer	Ryo YOSHIIE Associate Professor

●Course Purpose

To learn the fundamental knowledge of energy conversion systems and their relations with resources and environments, based on the mechanical engineering. Achievement purpose 1.to understand the basis of thermodynamics, and be able to make the calculation connected with them 2.to understand the principle of thermal engines and various energy conversion systems. 3.to understand the principle of global environmental problems, and be able to estimate the contribution of energy conversion systems to the global environment quantitatively from a standpoint of thermodynamics.

●Prerequisite Subjects

Mechanical engineering, Thermodynamics

●Course Topics

1.Energy resources 2.Fuel and combustion 3.Thermodynamic cycles and thermal engines 4.Energy utilization in local and global environmental problems 5.Advanced energy conversion technologies
Submit assignments, those will be given after several classes.

●Textbook

Thermal energy systems, 2nd edition (in Japanese), Kyoritsu Shuppan Co., Ltd.

●Additional Reading

Materials will be introduced in the class as needed.

●Grade Assessment

Term Examination and Reports for Exercises: Grades will be based on the term examination, while scores of reports will be considered as additional points. The full mark is 100 points, and the passing mark is 60 points or more.

●Notes

No special requirements are imposed.

●Contacting Faculty

Students may ask questions during and after the class via E-mail.
E-mail: ryo.yoshiie@mae.
(Add nagoya-u.ac.jp)

Management Engineering (2.0credits) (経営工学)

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

●Course Purpose

[purpose of the class] In the corporate management, I learn it about the management of the technique that is essential for the growth, development and the innovation.
[arrival target] I become able to understand a way of thinking and the basics of management. I understand an organization change and an organization design, the management of the innovation and come to be able to give explanation.

●Prerequisite Subjects

●Course Topics

Management of technology (MOT) and knowledge management
Management and artefact (artifact)
Organization to realize innovation
Science, technique, sense of values
Innovation and organization learning

[instructions of the class overtime learning]
Preparing a next class range, and understanding the meanings of the technical term.

●Textbook

Isao Naito, Yukihiro Wakuta edition (2016) " organization theory of the representation" CHUOKEIZAI-SHA

●Additional Reading

Instructions will be given as necessary in class

●Grade Assessment

[evaluation method] I give a small test to look back on the lecture content of the day before the end of the lecture of every time and have you finally submit a report. I evaluate it at 50% of normal points, report point 50%. In addition, I do not accept the submission of the report when there is absence more than 1/3.
[point of reference] Pass in understanding the basic concept and term in conjunction with the management engineering definitely; is based.

●Notes

There are no prerequisites.

●Contacting Faculty

I accept questions during the class.

Industry and Economy (2.0credits) (産業と経済)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Chemistry and Biotechnology	Department of Physical 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
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	Elective
Lecturer	Part-time Faculty		

●Course Purpose

I learn knowledge about the economy while examining the background, structure, influence about various economic phenomena, pocketbook issues.
I learn the economic thought method that economists built that understanding, explanation solves a pocketbook issue at the same time.

A target: In this lecture, a student attending a lecture aims for coming to be able to do the next thing.
1. As a member of society, an industrial person, I learn necessary and useful economic knowledge and come to be able to inflect.
2. I understand structure and the mechanism of the economic phenomenon, pocketbook issue and come to be thought systematically.
3. I understand the way of economic thought (view, way of thinking) and learn it and become able to inflect.

●Prerequisite Subjects

Because it is not a specialized subject, I do not appoint it in particular.

●Course Topics

1. Economic circulatory structure ... give-and-take
2. Change ... prosperous conditions and recession of the economy
3. Foreign exchange rate ... strong yen and weak yen
4. Role ... annual revenue and annual expenditure of the government
5. Maintenance of role ... price stability and the trust order of Bank of Japan
6. Problem ... overflow of population of the population and too few population
7. Economic history ... Smith and Keynes
8. Free-market economy ... light and shadow
9. Japanese economy ... inflation and deflation after World War II

Reading as I appoint the range that should read a textbook beforehand at the time of a lecture of every time for the next time.
In addition, reviewing it as I show a part to review and a method about the document which I distributed, and deepening understanding.

●Textbook

Nakaya"Nyumonsho wo yomumae no Keizaigaku nyumon",Doubunkan

●Additional Reading

P. A.Samuelson, W. D.Node house "economics" (Iwanami Shoten) Kennichi Miyazawa () "introduction to industrial linkage analysis" (Nikkei library, Nihon Keizai Shimbun, Inc.) Iwao Ozaki "industrial structure of Japan" (Keio University publication society)

R. A.I introduce it at the time of a lecture of every time including Feldman "economic latest lecture of the Dr. Feldman in Japan" (Bungeishunju Ltd.).

●Grade Assessment

Understand a basic concept about the economy definitely, and keep the structure of the pocketbook issue under control, and, in wearing an economic thought method, pass; is based. I evaluate an accomplishment degree by a small report (20%) to assign at the time of a lecture of every time and the regular examination (80%) of the term end and do higher than 60 points with a pass at one hundred perfect score. In addition, the absentee of the regular examination assumes it "absence".

●Notes

There are no prerequisites.

●Contacting Faculty

Around during the lecture and lecture time, a charge teacher copes in a lecture room

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	2 Autumn Semester	2 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

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	Gang ZENG Lecturer	Emanuel LELEITO Lecturer	GRIB Dina 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
The course will be delivered online via Zoom or Teams video conferencing with the help of NUCT. Prerecorded teaching materials are to be used partially and in this case students will be expected to use those to prepare for the the in-class discussions.

●Contacting Faculty
Questions are received during or after class time and via NUCT messenger.

Contact person: Emanuel LELEITO, leleito@nagoya-u.jp

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 NUPACE and NUSIP students.

●Contacting Faculty

The lecturer will answer questions about the content of the lesson, and the instructor in charge will answer other questions.

ysakai@mech.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

Training in Industrial Plants (2.0credits) (工場実習)

Course Type	Related Specialized Courses		
Class Format	Practice		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	3 Spring Semester		
Elective/Compulsory	Elective		
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

●Course Purpose

The purpose is to understand the qualities required of engineers through experience of research and practical training at actual research laboratories and factory, and to cultivate comprehensive skills by utilizing them for future courses and research. .The objective of this course is to be able to:1. You can learn the work contents and required abilities of engineers in actual research laboratories and factory.2. Understand how university courses are useful.

●Prerequisite Subjects

All studies that have been offered in this department

●Course Topics

Training according to the instructor of each company.After the training destination is decided, conduct a sufficient survey on the training destination company for your training. During the training period, preparation for the training and summarization after the training are done according to the instructor of the training destination.

●Textbook

Specified when necessary.

●Additional Reading

Specified when necessary.

●Grade Assessment

Evaluation is based on the report submitted from the training site.Pass if the goal is achieved

●Notes

No registration requirements required.

●Contacting Faculty

An instructor will respond appropriately at the training site.

Technical Visits in Companies and Laboratories A (1.0credits) (企業・研究所見学A)

Course Type	Related Specialized Courses		
Class Format	Practice		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	3 Spring Semester		
Elective/Compulsory	Elective		
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

●Course Purpose
Technical visits to industrial laboratories and plants.

Goal:
- To understand the technologies and researches that are required in industries
- To understand the relation between the studies at the university and the technologies in industries
- To obtain knowledge necessary for future job selection.

●Prerequisite Subjects
All studies in Electric and Electronic Engineering

●Course Topics
Technical visits and discussion at industries. Students are required to submit reports.

●Textbook
Specified when necessary.

●Additional Reading
Specified when necessary.

●Grade Assessment
Achievement will be evaluated through discussions and reports.

●Notes
Due to the COVID-19 pandemic, the planned technical visits may be cancelled.

●Contacting Faculty
Questions are accepted by supervisor of 3rd-year students via E-mail.

Technical Visits in Companies and Laboratories B (1.0credits) (企業・研究所見学B)

Course Type	Related Specialized Courses		
Class Format	Practice		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	3 Autumn Semester		
Elective/Compulsory	Elective		
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

●Course Purpose
Technical visits to industrial laboratories and plants.

Goal:
- To understand the technologies and researches that are required in industries
- To understand the relation between the studies at the university and the technologies in industries
- To obtain knowledge necessary for future job selection.

●Prerequisite Subjects
All the studies in Electric and Electronic Engineering.

●Course Topics
Technical visits and discussion at industries. Students are required to submit reports.

●Textbook
Specified when necessary.

●Additional Reading
Specified when necessary.

●Grade Assessment
Achievement will be evaluated through discussions and reports.

●Notes
Due to the COVID-19 pandemic, the planned technical visits may be cancelled.

●Contacting Faculty
Questions are accepted by supervisor of 3rd-year students via E-mail.

Overview of Advanced Electrical, Electronic & Information Engineering (2.0credits) (電気電子情報先端工学概論)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Electrical Engineering, Electronics, and Information Engineering		
Starts 1	1 Autumn Semester		
Elective/Compulsory	Elective		
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

●Course Purpose
This course discusses the fundamentals of, and current topics in each field of the advanced electrical,electronic and information engineering, with an overview of the status of their researches and developments in Japan. Topics to be introduced are those related with energy, material and device, information and communication, multimedia and so on.
Students will be familiar with the most advanced technologies in the above subject matter.

●Prerequisite Subjects
Physics, Electromagnetics, Mathematics

●Course Topics
This course consists of two parts:
1. Six lectures in the classroom which will be given by faculty members.
2. Tours to three laboratories of companies and/or research organizations.

These six lectures are divided three pairs of lectures and each pair is on one of Electrical Engineering, Electronics, and Information and Communication Engineering. Each lecture covers from the fundamental to the cutting-edge topics of the research area of the faculty member responsible to it.
During three tours, students will visit laboratories on energy generation and novel materials.

Submission of a report after each lecture and tour is mandatory.

●Textbook
Some books will be introduced in the lecture.

●Additional Reading
Some books will be introduced in the lecture.

●Grade Assessment
Submission of a report after each lecture and tour is mandatory. A knowledge of lectured advanced technologies in electrical,electronic and information engineering is evaluated by the reports. The final score is determined based on scores of these reports.Students must obtain a score of 60 or higher out of 100 to pass the course.

●Notes
Due to the COVID-19 infection, the lecture is provided by on-demand on NUCT.
The students ask lecturers by through NUCT "message" system. (Note: in this class, different faculty members give lectures on each topic each time.)

●Contacting Faculty
Students are encouraged to ask questions during and after lectures.
Faculty members can also be contacted at their offices, as well as by phone or email.
The question about the contents of lecture should be asked of each lecturer. The question about the others can be asked of Hiroki KOJIMA (kojima@nuee.nagoya-u.ac.jp).

Statistics and Analysis B (2.0credits) (データ統計解析Ｂ)

Course Type	Related Specialized Courses		
Class Format	Lecture		
Course Name	Department of Physical 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	
Elective/Compulsory	Elective	Elective	Elective
	Elective	Elective	
Lecturer	Ichiro TAKEUCHI Professor	Associated Faculty	

●Course Purpose

The current state-of-the-art artificial intelligence (AI) is developed using statistical machine learning. The goal of this course is to learn the mathematical foundation of statistical machine learning.

●Prerequisite Subjects

None, but it is desirable that students have already taken courses in linear algebra, calculus, probability and statistics, and computer programming.

●Course Topics

Foundation of probability and statistics for data analysisSupervised learning for regression problemsSupervised learning for classification problemsUnsupervised learningBasics of neural networks

●Textbook

Lecture materials will be provided.

●Additional Reading

An Introduction to Statistical Learning (Gareth James et al., SpringerElements of statistical learning 2nd ed. (Trevor Hastie et al., Springer)Pattern recognition and machine learning (Christopher M. Bishop, Springer)

●Grade Assessment

The score will be totally evaluated by the final examination (60%) and exercise reports (40%). The pass line is 60%.

●Notes

The lecture will be held in a face-to-face format, but it may be changed to an online or on-demand format depending on the status of covid-19.Lecture slides, including blank spaces, will be distributed, and students will write on them during the lecture. It is recommended that students print out the lecture slides in advance or prepare a tablet PC so that they can write on them during the lecture (details will be explained in the first lecture).Handwritten notes (no more than 8 pages of single-sided A4 paper) may be brought to the final exam (details will be explained in the first lecture).

●Contacting Faculty

Please contact the instructor by e-mail. The e-mail address will be provided at the beginning of the lecture.

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

Course Type	Related 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 teaches scientific writing and presentation skills necessary for explaining technical contents to others 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 Writing your speech
3.2 Slide design and presentation
3.3 Dealing effectively with Q & A

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

Based on reports and final presentation. Credits will be awarded to those students who can write abstracts and make an academic presentation using the basic skills learnt in class.On a scale of 0 to 100, the passing score is 60, with the scoring divided as follows:
1) Reports (60%): Each lecturer will ask you to prepare and submit reports to evaluate your understanding of the topics taught.
2) Presentation (40%): You will be asked to do a final presentation based on a combination of the skills learnt.

●Notes

All classes will be conducted online using Microsoft Teams or Zoom

●Contacting Faculty

Questions will be accepted in class or after the class using NUCT Message function

Coordinating Professor:
Gang Zengzeng.gang.s6(at)f.mail.nagoya-u.ac.jp