Basics of Design Engineering on Electronic Structures and Functions (2.0credits) (電子構造機能設計学基礎)

Course Type	Basic Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Design Innovation Engineering
Starts 1	1 Autumn Semester
Lecturer	Hajime KIMIZUKA Professor

●Course Purpose

The recent availability of powerful computers and computational techniques has enlarged the possibilities to perform electronic-state calculations (or first-principles calculations) for nanostructures with various compositions, so that electronic-state calculations have continued to be developed as a useful tool for materials design in the materials science and engineering field. To understand the essential elements and techniques of electronic-state calculations, the relevant theory and methods used will be introduced in this course. The course will also provide an overview of applications to the advanced analysis based on the electronic-state calculations.

●Prerequisite Subjects

Materials Quantum EngineeringMaterials Solid State PhysicsMaterials Quantum Chemistry

●Course Topics

The schedule of this class is as follows: (1) Class orientation and introduction(2) Atomic structure of crystals(3) Basics of quantum mechanics (I)(4) Basics of quantum mechanics (II)(5) Basics of statistical mechanics(6) The single-particle approximation (I): The Hartree approximation(7) The single-particle approximation (II): The Hartree-Fock approximation(8) The single-particle approximation (III): Density Functional Theory(9) Electrons in crystal potential(10) Band structure of crystals(11) Case studies (I): Static and dynamic properties(12) Case studies (II): Finding the reaction path(13) Exercises on electronic state calculations (I)(14) Exercises on electronic state calculations (II)(15) Presentation etc.Note that the schedule is tentative and the plan will be changed according to the learning situation. Students will be asked to submit a short report by the next time, as each assignment will be given.

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the class will be decided based on the following:Class attendance and attitude in class: 20%Short reports: 40%Presentation and exercise report: 40%

●Notes

There is no requirement to take this course.The classes will be conducted remotely (both in simultaneous interactive and on-demand formats) using Zoom and NUCT.Questions to the faculty should be directed to the NUCT function "Message".[Additional application for course registration]If you cannot browse the NUCT site until the additional application for course registration is approved, please contact kimizuka.hajime[at]material.nagoya-u.ac.jp.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".Faculty in charge:kimizuka.hajime[at]material.nagoya-u.ac.jp

Basics of Computational Material Design Engineering (2.0credits) (材料設計計算工学基礎)

Course Type	Basic Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

This course focuses on the fundamental bases and applications of phase diagram and phase transformations. The advanced techniques on materials science and engineering, i.e., the calculation of phase diagrams by CALPHAD method, and the simulation of phase transformations by phase-field method, are explained, comprehensively. Students will learn the systematic strategy to understand and control the internal complex microstructures in real materials based on the energetic approaches and dynamic simulations.
The goals of this course are as follows.

To understand the relation between phase diagrams and Gibbs energies.
To realize the sequence of phase transformations from phase diagrams and Gibbs energies.
To understand the meaning of TDB file format in CALPHAD method.
To look over the landscape of phase-field approaches.
To understand the physical meaning and mathematical derivation of gradient energy.
To understand the basis of micromechanics.
To understand the framework of computer simulation of phase transformations
and microstructure evolutions.

●Prerequisite Subjects

Metallography, Computational Materials Design

●Course Topics

The contents of this course are as follows.

1. Mathematical framework of general thermodynamics
2. Thermodynamics on phase diagrams
3. CALPHAD method and TDB file format
4. Thermodynamics of interface
5. Gibbs energy and diffusions
6. Phase-field method
7. Gradient energy and spinodal decomposition
8. Introduction to micromechanics
9. Computer simulations of phase transformations

Students should check the above items based on the textbook or documents on NUCT by the next lecture.

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T. Abe: Calculation of phase diagram by CALPHAD method, Uchida Rokakuho Pub. Co.Ltd., (2015).
T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the class will be decided based on the following:
Class attendance and attitude in class:10%,
Short reports: 10%,

Term-end examination: 80%
As for the each of CALPHAD method and phase-field method, pass the examination if the basic problem can be dealt with correctly, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.
Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).
Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.
Ask questions to teachers using the NUCT function "Message".
The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a lecture, or office hours (contact by e-mail or through the NUCT function "Message").
Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Basics on Structure Analysis using TEM (2.0credits) (電子線構造解析学基礎)

Course Type	Basic Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Design Innovation Engineering
Starts 1	1 Spring Semester
Lecturer	Takahisa YAMAMOTO Professor

●Course Purpose

Transmission electron microscopy is one of the very powerful analytical techniques for performing material analysis at nano-scale portions. In this lecture, we will introduce basics of transmission electron microscopy and the examples of application to material analysis. Lectures will be given on the contents that are considered to be the minimum necessary for actually analyzing the material. Exercises will be conducted as necessary so that the acquired knowledge can be used.
The objective of this lecture is as follows.
1. To understand the outline of the structure of the transmission electron microscope, the operation method, and the basics of the information obtained, and to be able to respond to basic technical issues related to microstructure analysis using the transmission electron microscope.
2. To understand the basic contents of interpretation of electron diffraction patterns and solve problems related to structural analysis of nano-scale regions.
3. To understand the basics of compositional analysis methods and data analysis, and solve problems related to composition measurement in fine regions.

●Prerequisite Subjects

●Course Topics

This lecture will be given by Japanese

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Basics of Metallurgy (2.0credits) (材料組織制御工学基礎)

Course Type	Basic Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Design Innovation Engineering	
Starts 1	Spring Semester ,every other year	
Lecturer	Hiroshi HARADA Professor	Yoshitaka ADACHI Professor

●Course Purpose

In this course, microstructure control in the casting, metal deformation and heat treatment processes, which are the main production processes of ferrous and non-ferrous material, are focused. Some critical issues involved in the aforementioned micro structure control are looked back and several advanced technologies are introduced to the students to deepen the understanding the microstructure control for further improvement of physical properties of structural materials.

●Prerequisite Subjects

Solidification engineering, Plastic deformation, phase transformation, structural material, fundamental metallurgy, material mechanics, transport phenomena

●Course Topics

Basis of solidification, metal deformation and heat treatment processes are reviewed. Moreover, several critical technologies about microstructure control in each process, are picked up and the working principle of each control technologies are discueesd.

●Textbook

Printed paper required for lecture items will be distributed.

●Additional Reading

Printed paper required for lecture items will be distributed.

●Grade Assessment

Students must get the total score as shown below based on each score of Exercises (quiz) and a couple of examinations (will be carried out) in this course.Students (2020~)10095948079706965646059 or belowStudents(~2019)1009089807970696059 or below

●Notes

●Contacting Faculty

Face-to-face discussions after class or exchanging e-mail.Prof. H.Harada: harada.hiroshi@material.nagoya-u.ac.jpProf. Y.Adachi: adachi.yoshitaka@material.nagoya-u.ac.jp

Basics of Diffusion in Solids (2.0credits) (固体内の拡散基礎)

Course Type	Basic Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Design Innovation Engineering
Starts 1	1 Autumn Semester
Lecturer	Yasutoshi IRIYAMA Professor

●Course Purpose

Diffusion in solid is important to consider doping of silicon wafer, ion transport inside solid electrolyte, etc. In this lecture, after learning about the basics on diffusion phenomena in solids and the basic measurement method of diffusion, we will focus on all solid-state batteries and ion transfer phenomena inside them (in electrodes, solid electrolytes, and interfaces). Students will be able to learn below things by learning this lecture.1. Understand the basic model of diffusion in solids and understand the factors involved.2. Understand the details of the factors that affect diffusion coefficients and apply them to specific problems.3. Understand the basics of diffusion measurement techniques and apply them to specific problems.4. Consider issues related on diffusion toward higher performance of all-solid-state batteries.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Computational Materials Design 1A (2.0credits) (計算材料設計セミナー1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

In this seminar, students read the recent papers on the computational and experimental materials design in the field of materials science and engineering, and make a presentation each other to deeply understand the recent development of this field. The goals of this seminar are 1) to learn the basis of modeling and simulation in materials science, and 2) to understand the methods and ideas on materials design and innovation.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.
Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (question and answer) in seminar: 50%
Presentation and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.
Classes will be conducted both face-to-face and remotely. Remote classes will be conducted via Zoom.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1A (2.0credits) (計算材料設計セミナー1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

In this seminar, students read the recent papers on the materials microstructure design in the field of materials science and engineering, and make a presentation each other in order to deeply understand the recent development of this field. The goals of this seminar are as follows.1. To learn the basis of materials design2. To understand the methods and ideas on materials innovation.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1A (2.0credits) (計算材料設計セミナー1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose
Achievement: 1. Understand the basics of material structure design. : 2. Understand the concepts and methods of material development. Read basic literature on material structure design and deepen understanding of research trends in related fields.

●Prerequisite Subjects
Basic subjects of the Department of Materials Design Engineering

●Course Topics
Fundamentals and applications of 3D material structure and property analysis

After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

●Additional Reading
Instructions will be given according to the progress of the lecture.

●Grade Assessment
Evaluate the degree of goal achievement based on test and exercise reports.
Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.
Appreciate understanding of the concept and method of material development is scored.

Students (2020~)
100959480797069656460 59 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty
e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1B (2.0credits) (計算材料設計セミナー1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

In this seminar, students read the recent papers on the computational and experimental materials design in the field of materials science and engineering, and make a presentation each other to deeply understand the recent development of this field. The goals of this seminar are 1) to learn the basis of modeling and simulation in materials science, and 2) to understand the methods and ideas on materials design and innovation.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar: 50%Presentation and discussion: 50%Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.Classes will be conducted both face-to-face and remotely. Remote classes will be conducted via Zoom.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".Faculty in charge:kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1B (2.0credits) (計算材料設計セミナー1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

In this seminar, students read the recent papers on the materials microstructure design in the field of materials science and engineering, and make a presentation each other in order to deeply understand the recent development of this field. The goals of this seminar are as follows.1. To learn the basis of materials design2. To understand the methods and ideas on materials innovation.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1B (2.0credits) (計算材料設計セミナー1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose
Achievement: 1. Understand the basics of material structure design. : 2. Understand the concepts and methods of material development. Read basic literature on material structure design and deepen understanding of research trends in related fields.

●Prerequisite Subjects

●Course Topics
After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

●Additional Reading
Instructions will be given according to the progress of the lecture.

●Grade Assessment
Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.
Appreciate understanding of the concept and method of material development is scored.

Students (2020~)
100959480797069656460 59 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty
e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1C (2.0credits) (計算材料設計セミナー1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

In this seminar, students read the recent papers on the computational and experimental materials design in the field of materials science and engineering, and make a presentation each other to deeply understand the recent development of this field. The goals of this seminar are 1) to understand the approaches of modeling and simulation in materials science, and 2) to be able to propose ideas for improving advanced materials.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.
Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (question and answer) in seminar: 50%
Presentation and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.
Classes will be conducted both face-to-face and remotely. Remote classes will be conducted via Zoom.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1C (2.0credits) (計算材料設計セミナー1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

In this seminar, students read the recent papers on the materials microstructure design in the field of materials science and engineering, and make a presentation each other in order to deeply understand the recent development of this field. The goals of this seminar are as follows.1. To understand the special and wide knowledges in materials science and engineering.2. To be able to propose novel ideas for improving advanced materials.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a lecture, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1C (2.0credits) (計算材料設計セミナー1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose
Achievement: 1. Understand the basics of material structure design. : 2. Understand the concepts and methods of material development. Read basic literature on material structure design and deepen understanding of research trends in related fields.

●Prerequisite Subjects

●Course Topics
After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

●Additional Reading
Instructions will be given according to the progress of the lecture.

●Grade Assessment
Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.
Appreciate understanding of the concept and method of material development is scored.

Students (2020~)
100959480797069656460 59 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty
e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1D (2.0credits) (計算材料設計セミナー1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

In this seminar, students read the recent papers on the computational and experimental materials design in the field of materials science and engineering, and make a presentation each other to deeply understand the recent development of this field. The goals of this seminar are 1) to understand the approaches of modeling and simulation in materials science, 2) to be able to propose ideas for improving advanced materials, and 3) to be able to appropriately answer the research questions as a specialist in the field.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.
Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (question and answer) in seminar: 50%
Presentation and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.
Classes will be conducted both face-to-face and remotely. Remote classes will be conducted via Zoom.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1D (2.0credits) (計算材料設計セミナー1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

In this seminar, students read the recent papers on the materials microstructure design in the field of materials science and engineering, and make a presentation each other in order to deeply understand the recent development of this field. The goals of this seminar are as follows.1. To understand the special and wide knowledges in materials science and engineering.2. To be able to propose novel ideas for improving advanced materials.3. To be able to answer the questions appropriately as a specialist.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 1D (2.0credits) (計算材料設計セミナー1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose
Achievement: 1. Understand the basics of material structure design. : 2. Understand the concepts and methods of material development. Read basic literature on material structure design and deepen understanding of research trends in related fields.

●Prerequisite Subjects

●Course Topics
After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

●Additional Reading
Instructions will be given according to the progress of the lecture.

●Grade Assessment
Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.
Appreciate understanding of the concept and method of material development is scored.
Students (2020~)
1009594807970696564 6059 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty
e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 1A (2.0credits) (先端計測分析セミナー1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 1A (2.0credits) (先端計測分析セミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Spring Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 1B (2.0credits) (先端計測分析セミナー1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 1B (2.0credits) (先端計測分析セミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Autumn Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@numse.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 1C (2.0credits) (先端計測分析セミナー1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 1C (2.0credits) (先端計測分析セミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Spring Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 1D (2.0credits) (先端計測分析セミナー1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 1D (2.0credits) (先端計測分析セミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Autumn Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Nanostructure Design 1A (2.0credits) (ナノ構造設計セミナー1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

Electrochemistry, Physical chemistry, Crystalline materials

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 1A (2.0credits) (ナノ構造設計セミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Spring Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1. understand the basics of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structual Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi HaradaExt.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki YukawaExt.3572yukawa@nagoya-u.jp
Eiji AbeExt.3578abe.eiji@material.nagoya-u.ac.jp

Seminars on Nanostructure Design 1B (2.0credits) (ナノ構造設計セミナー1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 1B (2.0credits) (ナノ構造設計セミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Autumn Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1.understand the basics of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structual Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi HaradaExt.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki Yukawa Ext.3572yukawa@nagoya-u.jp
Eiji AbeExt.3578abe.eiji@material.nagoya-u.ac.jp

Seminars on Nanostructure Design 1C (2.0credits) (ナノ構造設計セミナー1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 1C (2.0credits) (ナノ構造設計セミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Spring Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1.understand the basics of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structual Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi Harada Ext.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki YukawaExt.3572yukawa@nagoya-u.jp
Eiji Abe Ext.3578abe.eiji@material.nagoya-u.ac.jp

Seminars on Nanostructure Design 1D (2.0credits) (ナノ構造設計セミナー1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 1D (2.0credits) (ナノ構造設計セミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Autumn Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.The objective of this course is to be able to:1.understand the basics of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structual Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. PressTransport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing CompanyFundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports. The degree of achievement for the achievement target is evaluated by reports and presentations.“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi Harada Ext.5307harada.hiroshi@material.nagoya-u.ac.jpNobuki YukawaExt.3572yukawa@nagoya-u.jpEiji Abe Ext.3578abe.eiji@material.nagoya-u.ac.jp

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by studying in an abroad laboratory and learn different methods and ways of thinking, as well as communicate on a daily base with foreign researchers.

By completing the course, the students are expected to acquire various research methods and ways of thinking, gain the ability to tackle research problems from multiple angles, and acquire a broad international perspective.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject, English, Advanced Lectures on Scientific English

●Course Topics

Students will stay in an abroad laboratory that will be chosen based on the participant’s research field and interest. The course consists of the following contents.

1. Theme setting and literature review
2. Formulating a research plan
3. Analyzing the results and discussion
4. Presentation of the results

After the class, students should review the analyzing processes of the research results and investigate related literatures.

●Textbook
Will be introduced at the host laboratory depending on the research subject

●Additional Reading
Will be introduced at the host laboratory if necessary

●Grade Assessment
Conducting research in an abroad laboratory for one semester and submitting a report is a prerequisite. Evaluation will be based on the student's report (50%) and oral presentation (50%). To pass, the students have to demonstrate that they have the capacity to adequately analyze the results and have acquired the basic knowledge to interpret the results.

●Notes

●Contacting Faculty
Questions will be answered by the supervisors at the host laboratory during the course.

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by studying in an abroad laboratory and learn different methods and ways of thinking, as well as communicate on a daily base with foreign researchers.

By completing the course, the students are expected to acquire various research methods and ways of thinking, gain the ability to tackle research problems from multiple angles, and acquire a broad international perspective.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject, English, Advanced Lectures on Scientific English

●Course Topics

Students will stay in an abroad laboratory that will be chosen based on the participant’s research field and interest. The course consists of the following contents.

1. Theme setting and literature review
2. Formulating a research plan
3. Analyzing the results and discussion
4. Presentation of the results

After the class, students should review the analyzing processes of the research results and investigate related literatures.

●Textbook
Will be introduced at the host laboratory depending on the research subject

●Additional Reading
Will be introduced at the host laboratory if necessary

●Grade Assessment
Conducting research in an abroad laboratory for two semesters and submitting a report is a prerequisite. Evaluation will be based on the student's report (50%) and oral presentation (50%). To pass, the students have to demonstrate that they have the capacity to adequately analyze the results and have acquired the basic knowledge to interpret the results.

●Notes

●Contacting Faculty
Questions will be answered by the supervisors at the host laboratory during the course.

nced Experiments and Exercises on Computational Materials Design 1 (2.0credits) (計算材料設計特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring and Autumn Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

In the Experiments and Exercises in Materials Engineering 1, students are required to make experimental/computational works and exercises concerning the materials science and engineering, accepting advice and instructions from the teaching staffs of the laboratories. Thorough the experiments/computations and exercises, students are expected to improve their knowledge of the basic sciences and engineering in the fields of materials researches. The students are also expected to deepen their understandings of their own research subjects.
The goals of this course are 1) to learn the basis of modeling and simulation in materials science, and 2) to understand the methods and ideas on materials design and innovation.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Engineering

●Course Topics

The contents of this course are as follows.

1. Setting the research theme and planning computational experiments
2. Exercises on the theory and calculation techniques
3. Making computational experiments according to the initial plan
4. Analysis of the calculation results and discussion
5. Modification of computational experiments

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (experiments and ex): 50%
Plan of computational experiments, results and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

nced Experiments and Exercises on Computational Materials Design 1 (2.0credits) (計算材料設計特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring and Autumn Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

In the experiments and exercises in materials engineering 1 and 2, students are required to make experimental works and exercises concerning the materials science and engineering in laboratory, accepting advice and instructions from the teaching staffs of the laboratories. Thorough the experiments and exercises, students are expected to improve their knowledge of the basic sciences and engineering in the fields of materials researches. The students are also expected to deepen their understandings of their own research subjects.The goals of this course are as follows.1. To learn the basis of materials design2. To understand the methods and ideas on materials innovation.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Engineering

●Course Topics

The contents of this course are as follows.1. Setting the theme and planning computational experiments concerning the theme2. Exercises of the theoretical background and the calculation techniques 3. Making computational experiments according to the initial plan 4. Analysis of the calculation results and discussions5. Modification of computational experimentStudents should check the related research papers and textbooks if necessary.

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (experiment and practice):50%, Plan of computational experiments, calculation results and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after experiment and practice, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

nced Experiments and Exercises on Computational Materials Design 1 (2.0credits) (計算材料設計特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring and Autumn Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose

Materials Engineering Special Experiments and Exercises In A and B, students will understand basic academics in various fields related to material functions and creation processes by conducting experiments and exercises with the advice and guidance of laboratory advisers. And deepen the basics of engineering.

●Prerequisite Subjects

●Course Topics

1. Set theme and formulate experimental plan Exercises on theory and experimental methods 2. Implementation of experiments and analysis of experimental results 3. Discussion of experimental results, discussion with supervisors 4. Test plan amendment table

After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

Instructions will be given according to the progress of the lecture.

●Additional Reading

Instructions will be given according to the progress of the lecture.

●Grade Assessment

Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.

Students (2020~)
1009594807970696564 6059 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty

e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

nced Experiments and Exercises on Computational Materials Design 2 (2.0credits) (計算材料設計特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring and Autumn Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

In the Experiments and Exercises in Materials Engineering 2, students are required to make experimental/computational works and exercises concerning the materials science and engineering, accepting advice and instructions from the teaching staffs of the laboratories. Thorough the experiments/computations and exercises, students are expected to improve their knowledge of the basic sciences and engineering in the fields of materials researches. The students are also expected to deepen their understandings of their own research subjects.
The goals of this course are 1) to learn the basis of modeling and simulation in materials science, and 2) to understand the methods and ideas on materials design and innovation.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Engineering

●Course Topics

The contents of this course are as follows.

1. Setting the research theme and planning computational experiments
2. Exercises on the theory and calculation techniques
3. Making computational experiments according to the initial plan
4. Analysis of the calculation results and discussion
5. Modification of computational experiments

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (experiments and ex): 50%
Plan of computational experiments, results and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

nced Experiments and Exercises on Computational Materials Design 2 (2.0credits) (計算材料設計特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring and Autumn Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

In the experiments and exercises in materials engineering 1 and 2, students are required to make experimental works and exercises concerning the materials science and engineering in laboratory, accepting advice and instructions from the teaching staffs of the laboratories. Thorough the experiments and exercises, students are expected to improve their knowledge of the basic sciences and engineering in the fields of materials researches. The students are also expected to deepen their understandings of their own research subjects.The goals of this course are as follows.1. To learn the basis of materials design2. To understand the methods and ideas on materials innovation.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Engineering

●Course Topics

The contents of this course are as follows.1. Setting the theme and planning computational experiments concerning the theme2. Exercises of the theoretical background and the calculation techniques 3. Making computational experiments according to the initial plan 4. Analysis of the calculation results and discussions5. Modification of computational experimentStudents should check the related research papers and textbooks if necessary.

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (experiment and practice):50%, Plan of computational experiments, calculation results and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after experiment and practice, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

nced Experiments and Exercises on Computational Materials Design 2 (2.0credits) (計算材料設計特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring and Autumn Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose

Materials Engineering Special Experiments and Exercises In A and B, students will understand basic academics in various fields related to material functions and creation processes by conducting experiments and exercises with the advice and guidance of laboratory advisers. And deepen the basics of engineering.

●Prerequisite Subjects

●Course Topics

After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

Instructions will be given according to the progress of the lecture.

●Additional Reading

Instructions will be given according to the progress of the lecture.

●Grade Assessment

Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.

Students (2020~)
1009594807970696564605 9 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty

e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

nced Experiments and Exercises on Computational Materials Design 1 (2.0credits) (先端計測分析特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring and Autumn Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Using material evaluation and analysis technique based on transmission electron microscopy, research methods, methods of compiling obtained research results, presentation skills, mainly through experiments and exercises on microstructure control and functional control of ceramic materials will be obtained.The aim is to be able to do the following by taking this lecture.1. To conduct research on materials with their own abilities.2. To acquire the presentation ability to publish the obtained results3. To acquire the ability to summarize the results obtained as a dissertation

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

nced Experiments and Exercises on Computational Materials Design 1 (2.0credits) (先端計測分析特別実験及び演

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Spring and Autumn Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

In the Experiments and Exercises in Materials Design Innovation Engineering 1 and , students are required to make laboratory experimental works and exercises concerning the materials science and engineering, accepting advices and instructions from the teaching staffs of the laboratories. Thorough the experiments and exercises, students are expected to advance their knowledge of the basic sciences in the fields of materials research. The students are also expected to deepen their understandings of their own research subjects.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Engineering.

●Course Topics

1. Setting the theme and planning experiments concerning the theme 2. Exercises of the theoretical background and the experimental techniques 3. Making experiments according to the initial plan 4. Analysis of the experimental results and discussions.

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Evaluation of the attainment of experiments and exercises by the teaching staffs, Written reports, Oral presentation.

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

nced Experiments and Exercises on Computational Materials Design 2 (2.0credits) (先端計測分析特別実験及び演

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring and Autumn Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Using material evaluation and analysis technique based on transmission electron microscopy, research methods, methods of compiling obtained research results, presentation skills, mainly through experiments and exercises on microstructure control and functional control of ceramic materials will be obtained.The aim is to be able to do the following by taking this lecture.1. To conduct research on materials with their own abilities.2. To acquire the presentation ability to publish the obtained results3. To acquire the ability to summarize the results obtained as a dissertation

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

nced Experiments and Exercises on Computational Materials Design 2 (2.0credits) (先端計測分析特別実験及び演

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Spring and Autumn Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

In the Experiments and Exercises in Materials Design Innovation Engineering 1 and , students are required to make laboratory experimental works and exercises concerning the materials science and engineering, accepting advices and instructions from the teaching staffs of the laboratories. Thorough the experiments and exercises, students are expected to advance their knowledge of the basic sciences in the fields of materials research. The students are also expected to deepen their understandings of their own research subjects.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Engineering.

●Course Topics

1. Setting the theme and planning experiments concerning the theme 2. Exercises of the theoretical background and the experimental techniques 3. Making experiments according to the initial plan 4. Analysis of the experimental results and discussions

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Evaluation of the attainment of experiments and exercises by the teaching staffs, Written reports, Oral presentation.

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Advanced Experiments and Exercises on Nanostructure Design 1 (2.0credits) (ナノ構造設計工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Spring and Autumn Semester		
Lecturer	Yasutoshi IRIYAMA Professor	MunekazuMOTOYAMA Lecturer	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Based on nanomaterials engineering, students conduct experiments, measurements, theoretical calculations and simulations on all-solid-state secondary batteries and solid-state ionics from physical and chemical aspects. Students lean to understand the background and background of the research, clarify the issues based on them, and verbally understand how to plan experiments to overcome the issues, scientific thinking and insight, and the results obtained from them Acquire skills to make presentation easy. The aim is to find advanced knowledge in the field and skills to understand it, foster independent creativity, and foster a quest to face different fields.Aims of this classBy learning this lecture, students will be able to:1. Understand the background of research areas and acquire the ability to classify them.2. Gain the ability to grasp issues in a research area based on classifications and draft guidelines for solving the issues based on academic knowledge.3. Make their own research plans, summarize their findings in notebooks, and acquire basic knowledge related to research.4. Present research results and explain and discuss the results logically

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

H"Solid State Electrochemistry" edited by P. Bruce

●Grade Assessment

●Notes

●Contacting Faculty

dvanced Experiments and Exercises on Nanostructure Design 1 (2.0credits) (ナノ構造設計工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Spring and Autumn Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Hiroshi HaradaExt.5307harada.hiroshi@material.nagoya-u.ac.jpNobuki YukawaExt.3572yukawa@nagoya-u.jpEiji AbeExt.3578abe.eiji@material.nagoya-u.ac.jp

Advanced Experiments and Exercises on Nanostructure Design 2 (2.0credits) (ナノ構造設計工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Spring and Autumn Semester		
Lecturer	Yasutoshi IRIYAMA Professor	MunekazuMOTOYAMA Lecturer	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Based on nanomaterials engineering, students conduct experiments, measurements, theoretical calculations and simulations on all-solid-state secondary batteries and solid-state ionics from physical and chemical aspects. Students lean to understand the background and background of the research, clarify the issues based on them, and verbally understand how to plan experiments to overcome the issues, scientific thinking and insight, and the results obtained from them Acquire skills to make presentation easy. The aim is to find advanced knowledge in the field and skills to understand it, foster independent creativity, and foster a quest to face different fields.Aims of this classBy learning this lecture, students will be able to:1. Understand the background of research areas and acquire the ability to classify them.2. Gain the ability to grasp issues in a research area based on classifications and draft guidelines for solving the issues based on academic knowledge.3. Make their own research plans, summarize their findings in notebooks, and acquire basic knowledge related to research.4. Present research results and explain and discuss the results logically

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Advanced Experiments and Exercises on Nanostructure Design 2 (2.0credits) (ナノ構造設計工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Spring and Autumn Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Hiroshi Harada Ext.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki Yukawa Ext.3572yukawa@nagoya-u.jp
Eiji Abe Ext.3578abe.eiji@material.nagoya-u.ac.jp

Integration of Materials Design (2.0credits) (統合型材料デザイン)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Autumn Semester		
Lecturer	Toshiyuki KOYAMA Professor	Yoshitaka ADACHI Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

This lectrue highlights AI-materials science and computational engineering in materials science and metallurgy. High throughput, integration, and mechanism understanding in materials sicence and metallurgy are focused.The goals of this course are as follows.To understand the difference between probability and likelihood.To look over the landscape of machine learning techniques.To understand the meaning and mathematical background of data assimilation twchnique.To understand the detail of neural network approximation.

●Prerequisite Subjects

Materials Physics, Iron and Steels, Non-Ferrous Metals and Alloys

●Course Topics

The contents of this course are as follows.1. 3-dimensional quantitative microscopy (1)2. 3-dimensional quantitative microscopy (2)3. Machin learning for materials science and engineering4. Neural network (1)5. Neural network (2)6. Image segmentation of target region from materials microstructures7. Deep learning on materials microstructures8. Generation of 3-dimensional microstructure data by phase-field method (1)9. Generation of 3-dimensional microstructure data by phase-field method (2)10. Phase-field micro-elasticity theory11. Eshelby's equivalent inclusion theory 12. Mean field approximation on composite materials13. Secant method14. Application to various materials and properties (1) 15. Application to various materials and properties (2)Students should check the above items based on the textbook or documents on NUCT by the next lecture.

●Textbook

Y. Adachi and T. Koyama: Intoroduction to 3-dimensional microstructure analysys and materials property calculations", M. Niinomi (Ed.), Uchidarokakuho Pub. Co. Ltd., (2014).

●Additional Reading

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Grade Assessment

Your overall grade in the class will be decided based on the following:Class attendance and attitude in class:10%, Short reports: 10%, Term-end examination: 80%As for the each of Machin learning and mean field approximation on composite materials, pass the examination if the basic problem can be dealt with correctly, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

There is no requirements to take this course.Implementation policy with respect to Corona virus infection: Please refer to the NUCT for the details of this course.

●Contacting Faculty

Recess after a lecture, or office hours (contact by e-mail).adachi.yoshitaka[at]material.nagoya-u.ac.jp

Technology & Application of Synchrotron Radiation (2.0credits) (シンクロトロン光応用工学)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor

●Course Purpose

[Accelerator science] Understand principles of particle accelerators. [Material Science] Understand principles of synchrotron photoelectron spectroscopies.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator science] 1. History of particle accelerators.:2. Principle and structure of electron storage ring as a source of synchrotron radiation.:3. Dynamics of electron beam in storage ring. [Material Science] 1. Principles of photoelectron spectroscopies.:2. Photoemission spectroscopy.:3. Synchrotron photoemission study on functional materials.

●Textbook

Handouts are distributed as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports. 60% to pass

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Practical Training on Materials Design Innovation Engineering (2.0credits) (材料デザインエンジニアリング実習)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Experiment and Exercise
Course Name	Materials Design Innovation Engineering
Starts 1	1 Autumn Semester
Lecturer	Associated Faculty

●Course Purpose

Students will learn how to approach the construction of a problem-solving methodology at multiple laboratories across the department through practical trainings. The purpose of this course is to learn how to use experimental devices, data analysis methods, and related know-hows at laboratories outside their labs so that they can use them for their own researches.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Innovation Engineering

●Course Topics

The overall flow is as follows.(1) Participate in M1 presentations (including M2 and B4 presentations), and learn about the research of other laboratories. (2) Summarize the content that student wants to deepen their research, and make suggestions and explain the content. (3) Teacher will give advice and introduce related papers and books. (4) Summarize the feasibility of the research as a research procedure manual, and present and discuss in front of teacher. (Note) Other laboratories are limited to those of the Department of Materials Design Innovation Engineering.

●Textbook

We will introduce as needed.

●Additional Reading

We will introduce as needed.

●Grade Assessment

Discussion, report, and presentation

●Notes

There is no requirement to take this course.

●Contacting Faculty

E-mail or office hours

pecial Lecture on Materials Design Innovation (Special Lecture) (1.0credits) (材料デザイン工学特論（特別講義）

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Design Innovation Engineering
Starts 1	1 Spring and Autumn Semester
Lecturer	Associated Faculty

●Course Purpose

In the course of the Advanced Lecture on Materials Science and Engineering, lectures are given by external lecturers who are expert engineers, active researchers and professors of various companies, research institutes and universities. The lectures concern with various recent topics in materials science and engineering. Through the lectures, students are expected to obtain knowledge of the recent scientific topics in materials science and engineering. Students are also expected to deepen their understanding on the master course research themes and to widen their scientific view.

●Prerequisite Subjects

Major subjects of the Department of Materials Design Innovation Engineering

●Course Topics

Special lectures of the issues concerning materials science and engineering

●Textbook

We will introduce as needed.

●Additional Reading

We will introduce as needed.

●Grade Assessment

Examination or written report

●Notes

There is no requirement to take this course.

●Contacting Faculty

After the lecture or e-mail

Innovation Practice Course (4.0credits) (イノベーション体験プロジェクト)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Under the instruction of the company engineer (DP, Directing Professor), I carry out the project for the problem solution by the team of several people consisting of different specialisms. In this way, it is intended to let you sense ability for problem discovery, the importance of the general intellectual power of compound eyes on the basis of real world bodily.
I know a point of view, the plan as the company and perform a discussion, exchange of opinions between the different specialty and aim for the breeding of the viewpoint general, to see engineering by examining it as the problem solution person concerned from different angles.

●Prerequisite Subjects

It is strongly recommended to take the industry-university joint educational courses such as Focus on Venture Business and ,etc.

●Course Topics

I organize different specialty, the team (several/team) consisting of the students of the department several sets, and DP is the instruction in each each team. Based on the project theme that DP determined, I set the problem that a student carries out concretely. For 75 hours (principle one day a week), I accomplish the project for the problem solution.
Prior lecture to affect a project theme by the DP
Setting (opinion, information exchange, allied investigation, examination, discussion) of the concrete problem by the student
Enforcement of the problem solution project
Summary, report of the result

I assume this a main component.
In addition, I may be given an investigation and the consideration in conjunction with the theme as a problem from DP. Report it in a date (the next time lectures) when it was appointed, and announce it; and a thing corresponding to the exchange of opinions in the team.

●Textbook

Papers, books and/or documents that the lecturer (DP) will introduce.

●Additional Reading

Papers, books and/or documents that the lecturer (DP) will introduce.

●Grade Assessment

I evaluate it through accomplishment, the discussion of the project, result announcement. If a consideration power, the adjustability for the problem solution, the expansion of the field of vision are accepted, it is said that I pass.

●Notes

No specific requirements.

●Contacting Faculty

The lecturer (DP) and the project staff of the university accept questions at any time.

Research Internship１ U2 (2.0credits) (研究インターンシップ１ U2)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Through the training to affect technology development, the study of the company in the company is advanced, and experience the challenge to a practical problem. In this way, it is aimed for upbringing of human resources tying engineering to creation of the social value.
It is wider in a technique and a study, and a consciousness, ability to catch in a general viewpoint (utility, economy) and communication power is bred and aims for what is reflected by a study, the study at the university.

●Prerequisite Subjects

It is strongly recommended to take the industry-university joint educational courses such as Focus on Venture Business and ,etc.

●Course Topics

In the company accepting an intern, I make the training (study) about the study theme that a company shows.
Orientation to affect the overall company concerned and the training medium
Enforcement (including cooperation, the adjustment with the company staff) of the training theme
Summary, report of the training result
I assume a report (presentation) of the training result to the university a main component.
As the associated document, documents investigation may not support during the working hours that a company sets, I do the attendance of the lecture about "the handling, a point to keep in mind by basic knowledge and the study internship of intellectual property rights" to need what I study in the training overtime by oneself, and to perform on the university side prior to the company training again with

requisiteness.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

I am given in the following on 20th in the total days that engaged in the training in the company.
I do that I announce the result to the university in a result briefing session to perform after the training if essential.
I evaluate it based on result announcement contents and an evaluation book of the training staff making. I recognize an experience-based effect in the training by oneself, and will to plan reflection to a study, the study at the university does it with a pass if admitted.

●Notes

No specific requirements.

●Contacting Faculty

The training staff of the company and the study internship staff of the university accept questions at any time.

Research Internship１ U3 (3.0credits) (研究インターンシップ１ U3)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Through the training to affect technology development, the study of the company in the company is advanced, and experience the challenge to a practical problem. In this way, it is aimed for upbringing of human resources tying engineering to creation of the social value.
It is wider in a technique and a study, and a consciousness, ability to catch in a general viewpoint (utility, economy) and communication power is bred and aims for what is reflected by a study, the study at the university.

●Prerequisite Subjects

It is strongly recommended to take the industry-university joint educational courses such as Focus on Venture Business and ,etc.

●Course Topics

In the company accepting an intern, I make the training (study) about the study theme that a company shows.
Orientation to affect the overall company concerned and the training medium
Enforcement (including cooperation, the adjustment with the company staff) of the training theme
Summary, report of the training result
I assume a report (presentation) of the training result to the university a main component.
As the associated document, documents investigation may not support during the working hours that a company sets, I do the attendance of the lecture about "the handling, a point to keep in mind by basic knowledge and the study internship of intellectual property rights" to need what I study in the training overtime by oneself, and to perform on the university side prior to the company training again with

requisiteness.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days between 21 and 40 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The training staff of the company and the study internship staff of the university accept questions at any time.

Research Internship１ U4 (4.0credits) (研究インターンシップ１ U4)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Through the training to affect technology development, the study of the company in the company is advanced, and experience the challenge to a practical problem. In this way, it is aimed for upbringing of human resources tying engineering to creation of the social value.
It is wider in a technique and a study, and a consciousness, ability to catch in a general viewpoint (utility, economy) and communication power is bred and aims for what is reflected by a study, the study at the university.

●Prerequisite Subjects

It is strongly recommended to take the industry-university joint educational courses such as Focus on Venture Business and ,etc.

●Course Topics

In the company accepting an intern, I make the training (study) about the study theme that a company shows.
Orientation to affect the overall company concerned and the training medium
Enforcement (including cooperation, the adjustment with the company staff) of the training theme
Summary, report of the training result
I assume a report (presentation) of the training result to the university a main component.
As the associated document, documents investigation may not support during the working hours that a company sets, I do the attendance of the lecture about "the handling, a point to keep in mind by basic knowledge and the study internship of intellectual property rights" to need what I study in the training overtime by oneself, and to perform on the university side prior to the company training again with

requisiteness.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days between 41 and 60 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The training staff of the company and the study internship staff of the university accept questions at any time.

Research Internship１ U6 (6.0credits) (研究インターンシップ１ U6)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Through the training to affect technology development, the study of the company in the company is advanced, and experience the challenge to a practical problem. In this way, it is aimed for upbringing of human resources tying engineering to creation of the social value.
It is wider in a technique and a study, and a consciousness, ability to catch in a general viewpoint (utility, economy) and communication power is bred and aims for what is reflected by a study, the study at the university.

●Prerequisite Subjects

It is strongly recommended to take the industry-university joint educational courses such as Focus on Venture Business and ,etc.

●Course Topics

In the company accepting an intern, I make the training (study) about the study theme that a company shows.
Orientation to affect the overall company concerned and the training medium
Enforcement (including cooperation, the adjustment with the company staff) of the training theme
Summary, report of the training result
I assume a report (presentation) of the training result to the university a main component.
As the associated document, documents investigation may not support during the working hours that a company sets, I do the attendance of the lecture about "the handling, a point to keep in mind by basic knowledge and the study internship of intellectual property rights" to need what I study in the training overtime by oneself, and to perform on the university side prior to the company training again with

requisiteness.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days between 61 and 80 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The training staff of the company and the study internship staff of the university accept questions at any time.

Research Internship１ U8 (8.0credits) (研究インターンシップ１ U8)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Through the training to affect technology development, the study of the company in the company is advanced, and experience the challenge to a practical problem. In this way, it is aimed for upbringing of human resources tying engineering to creation of the social value.
It is wider in a technique and a study, and a consciousness, ability to catch in a general viewpoint (utility, economy) and communication power is bred and aims for what is reflected by a study, the study at the university.

●Prerequisite Subjects

Students attending Research Internship are strongly recommended to take short-term Patent Laws and Focus on Venture Business I or II before the attendance.

●Course Topics

In the company accepting an intern, I make the training (study) about the study theme that a company shows.
Orientation to affect the overall company concerned and the training medium
Enforcement (including cooperation, the adjustment with the company staff) of the training theme
Summary, report of the training result
I assume a report (presentation) of the training result to the university a main component.
As the associated document, documents investigation may not support during the working hours that a company sets, I do the attendance of the lecture about "the handling, a point to keep in mind by basic knowledge and the study internship of intellectual property rights" to need what I study in the training overtime by oneself, and to perform on the university side prior to the company training again with

requisiteness.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days more than or equal to 81 daysin the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The training staff of the company and the study internship staff of the university accept questions at any time.

Advanced Lectures on Frontier Technologies and Sciences (1.0credits) (最先端理工学特論)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Manato DEKI Associate Professor		

●Course Purpose

To research in advanced engineering, it is necessary to learn the latest research trends through practice. Through symposium-style academic discussions, students will be able to study cutting-edge science and engineering research and discuss the latest trends in the subject areas.

●Prerequisite Subjects

Knowledge of the subject areas.

●Course Topics

Participated in special lectures set every year from the fields of biochemistry, analysis, semiconductors, polymers, and startups related to cutting-edge science and engineering, and participated in a symposium where research presentations on cutting-edge engineering were presented. By participating, students will study cutting-edge science and engineering research and discuss the latest trends in the subject areas. After taking the course, study and study the relevant field in detail.

●Textbook

Distribute as appropriate.

●Additional Reading

Distribute as appropriate.

●Grade Assessment

Participate in the VBL Symposium held around November, attend supplementary lectures, and submit a report.

Report. A score of 60 or more out of 100 will be passed. Pass if you have a broad understanding of the subject area. Highly appreciate the point of contact with your own research, new business and research proposals.

●Notes

There are no special requirements. Students who are interested in startups are preferred.

Important Notes
Students who wish to take the course will be able to register for the "Advanced Lectures on Frontier Technologies and Sciences" at NUCT after they have registered for the course.
Note that all contacts from NUCT are available for the lectures.
Students who missed the registration period should register the page of "Advanced Lectures on Frontier Technologies and Sciences" on the NUCT website.

●Contacting Faculty

Arranging the schedules by e-mail and etc.

Advanced Experiments for Frontier Technologies and Sciences (1.0credits) (最先端理工学実験)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Experiment		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Manato DEKI Associate Professor		

●Course Purpose

In order to advance research in engineering, it is necessary to learn about the latest research trends through practice. The purpose of this experiment is to conduct research experiments using the most advanced experimental equipment and simulators. Through this experiment, students will be able to understand the principles and learn how to use the equipment owned by VBL (maskless exposure system, dry etching system, atomic layer deposition system, metal deposition system) and device simulators. In addition, the goal is to comprehensively acquire knowledge and skills related to advanced experiments and presentation techniques for the assigned research by reporting the results.

●Prerequisite Subjects

it is advisable to acquire basic knowledge on the subject research.

●Course Topics

The experiment will be conducted at the Venture Business Laboratory building.
The report meeting will be held online or at the above building.
If you choose an assigned experiment with a predetermined task, the required curriculum includes the use of either a maskless exposure system, ICP etching system, or atomic layer deposition system. Students will use these devices to perform their assignments and learn the principles and practical use of these devices. In the case of experiments proposed by the students (original experiments), the students will propose their own device simulation experiments and research using the above equipment, and work with the instructor to produce experimental results. In the end, students will organize and discuss the results, present their findings, and learn how to practically use state-of-the-art equipment and simulation skills.

Students should learn the basic knowledge of the research they are assigned.

●Textbook
Distribute as needed. Please check the required documents by yourself.

●Additional Reading
Distribute as needed. Please check the required documents by yourself.

●Grade Assessment
Exercise (50%) and presentation of research results (50%) will be evaluated. Understanding the measurement principle and usage is used as a criterion for acceptance, but the research achievements and new approaches to research are highly evaluated. A score of 60 or more out of 100 is a passing score.

●Notes
Course Registration
No course requirements.
The number of registered students should be about 10.

Important Notes
Students who wish to take the course will be able to register for the "Advanced Experiments for Frontier Technologies and Sciences" at NUCT after they have registered for the course.
Note that all contacts from NUCT are available for the lectures.
Students who missed the registration period should register the page of "Advanced Experiments for Frontier Technologies and Sciences" on the NUCT website.

●Contacting Faculty
We will respond via NUCT's message system and e-mail.

Introduction to Academic Communication (1.0credits) (コミュニケーション学)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	Graduate Chemistry
	Automotive Engineering	Automotive Engineering	Civil and Environmental Engineering Graduate
	Physical Engineering Graduate		
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester		
Lecturer	ReikoFURUYA Associate Professor		

●Course Purpose

Students will learn presentation skills for academic purposes, which may include giving academic presentations.
Japanese students are expected to present in English and international students in Japanese in the seventh or eighth class meeting.
By taking this class, students are expected to be able to do the following:
-Give a solid presentation with confidence and without hesitance
-Grasp the characteristics of successful presentations
-Use techniques learned in class in their own presentation

●Prerequisite Subjects

English language classes for Japanese students
Japanese language classes for international students

●Course Topics

(1) Ways to convey messages in presentation
(2) The language of a presentation
(3) Tips for making effective slides
(4) Observation and analysis of video-taped presentation by a past student
(5) Paper vs presentation
(6) Preparation for individual presentation

(7) Individual presentations I
(8) Individual presentations

This course requires students to work outside of the classes for individual presentation.

●Textbook

Textbooks and references are not assigned for this class. However, depending on the student and class progress, necessary materials will be distributed in class.

●Additional Reading

1The Japan Times
2:

●Grade Assessment

Individual presentation: 50%
Active class participation: 50%

Grades: A+: 100%-95%, A: 94%-80%, B: 79%-70%, C: 69%-65%, C-: 64%-60%, F: 59%-0%

Grading will be decided based on the ability to give an effective academic presentation.

●Notes

There are no requirements for taking this class.
This class will be held face to face unless there are international students who cannot come to Japan.

●Contacting Faculty

Questions will be answered before class, in class, after class or by e-mail.
E-mail address　o47251a@cc.nagoya-u.ac.jp

Latest Advanced Technology and Tasks in Automobile Engineering (3.0credits) (先端自動車工学特論)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	Automotive Engineering
	Automotive Engineering		
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	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester		
Lecturer	Yasuhiko SAKAI Designated Professor		

●Course Purpose

This course is intended to study the latest advanced technology of automobile engineering from top researchers of universities and industries. The topics of lectures are related to almost all fields of automotive industries, such as hibrid cars, electric cars, automated driving and crash safety. It is asle intended to develop the English hearing/speaking ability. The attainment targets are as follows:

1. Understand the latest technology of automotive engineering.
2. Underatand company's automotive production system.
3. Improve English ability in the field of socience and engineering.
4. Strengthen communication skills and presentation skills in English by studying with international students.

●Prerequisite Subjects

lectures related to fundamental physics, mechanical, electrical and information engineering.

●Course Topics

A. Lectures

1. The Car Industry, Market Trend, Circumstance and Its Future.
2. Overview of Automotive Development Process.
3. Observation and Evaluation of Drivers' Behavior Perspective.
4. Car Materials and Processing.
5. Movements and Control of a Car.
6. Safety Engineering for the Prevention of Accidents.
7. Crash Safety.
8. Automobile Embedded Computing System.
9. Wireless Technologies in ITS.

10.Applications of CAE to Vehicle Development.
11.Energy Saving Technology for Automobiles.
12.Automated Driving.
13.Traffic Flow Characteristics.
14.Cars and Roads in Urban Transportation Context.
15.Automobile in Aging Society.
B. Factory Visits
1.Toyota Motors Corp., 2. Mitsubishi Motors Corp., 3. Toyota Boshoku Corp., 4.Suzuki Museum,
5.Toyota Commemorative Museum, 6. Traffic Safety and Environmental Lab.
C. Group Research Project
Several students form one group and each group selects one topic. They investigate and discuss about this topic and make presentations.
After each lecture is finished, read the handout and write a repor about each lecture with your comments.

●Textbook
Handout delivered in each lecture

●Additional Reading
Introduced in the lectures

●Grade Assessment
Evaluation will be based on (a) Discussions in the lectures 20%, (b) report for each lecture 20%, (c) group presentation 30%. and (d) report on research subject 30%. It is necessary to attend factory visits.In each item, the undastanding of the concepts is especially evaluated.
Summing up the all scores from (a) to (d) and the students with evaluation A, B, or C can pass this subject.

●Notes
1. There are limits of enrollment capacity.Full course student limit is about 10.Auditor limit for each lecture is about 10.
2. English ability is checked before accepted as a student.

●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

Advanced Lectures on Scientific English (1.0credits) (科学技術英語特論)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	Automotive Engineering
	Automotive Engineering	Civil and Environmental Engineering Graduate	Physical Engineering Graduate
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
Lecturer	Part-time Faculty		

●Course Purpose

This course aims to help students write a well-structured research paper in English and expand their vocabulary and expression list relating to academic writing.
By the end of the course, students will be able to:
- explain the basic structure of a research paper
- explain the characteristics of each component
- use vocabulary adequately
- use expressions adequately
- choose the most relevant citation style
- write a mini research paper

●Prerequisite Subjects

"English (basic)" and "English (intermediate)" (or equivalent)

●Course Topics

English is the language of instruction in this course.
After reviewing the basics of academic writing, students will understand the fundamental structure of the research paper. Students will improve their vocabulary and expressions to write a well-structured paper as they analyze sample research papers. Additionally, students will understand the citation styles by exploring the descriptions in the instructions for authors in the academic journals of their choice. In the classroom activities, students will exchange ideas, give an oral presentation, practice their writing skills, and give feedback to each other.
1. Basics of academic writing in English 1: Paragraph writing
2. Basics of academic writing in English 2: Making an outline
3. Fundamental structure of research paper: Structural analysis

4. Oral presentation: Journals, instructions for authors, and citation styles
5. Writing 1: Title and abstract
6. Writing 2: Research method
7. Writing 3: Results and discussions
8. Writing 4: Introduction and conclusion

●Textbook

No textbook for this class. Handouts will be distributed in class.

●Additional Reading

Glasman-Deal, H. (2021). Science Research Writing: For Non-Native Speakers of English. Imperial College Press.
Paltridge, B. (2019). Thesis and Dissertation Writing in a Second Language. Routledge.
Swales, J.M. & Feak, C.B. (2012). Academic Writing for Graduate Students. The University of Michigan Press.
Wallwork, A. (2013). English for Academic Research: Grammar, Usage and Style. Springer.
Wallwork, A. (2016). English for Writing Research Papers. Springer.

●Grade Assessment

The following evaluation items constitute the maximum score of 100:
Class Participation (25%)
Homework Assignments (35%)
Oral Presentation (10%)
Mini-Research Paper (30%)
A student must evidence a total score of 60 or higher on the final grading scale to pass this course.

●Notes

-No prerequisite.
-There is a chance to redesign the class format, schedule, and grading system depending on the COVID-19 situation.
-There will be approximately six face-to-face classes and two online (synchronous or on-demand) classes.
-Online, synchronous classes will be given on Zoom, whereas the on-demand classes will be given on NUCT.
-The first class will be met face-to-face in the regular classroom on campus, and the class format in the remaining semester will be announced via "Messages" on NUCT.
-Students are expected to express/exchange their ideas and opinions on NUCT and/or on another interactive presentation system to be announced in class.
-An active dialog is highly valued in this class, so your enthusiastic participation is vital to the success of your learning.
-Basically, homework is assigned on a weekly basis.

●Contacting Faculty

Use the "Messages" tool on NUCT to contact the instructor. Only for a limited period of time (until the secondary course registration period ends), you can reach the instructor by email.
smrym(at)lets.chukyo-u.ac.jp
Please replace (at) with @, the at symbol.

Focus on Venture Business I (2.0credits) (ベンチャービジネス特論 I)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
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	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	
Lecturer	Part-time Faculty	Manato DEKI Assistant Professor	

●Course Purpose

People often point out that the layer of startup companies should assume the leading edge is thin. Part of the cause depends on the system, but in many cases, it is due to the difference in perceptions of the entrepreneurship between East and Western researchers. In this course, you study the basic knowledge and goals required as engineers and researchers when commercializing/starting a “university research.” We will show examples of technology development and commercialization based on research results of universities, entrepreneurship in companies and venture startups, and consider venture business utilizing research. Through this lecture, entrepreneurs' mindsets will be formed as well as minimum knowledge of patents.

●Prerequisite Subjects

●Course Topics

Through the trend and environment of venture business in our country, we will consider what is necessary to actually and personally launch a venture business.

1. commercialization and entrepreneurship Why venture business ---Risks and advantages
2. knowledge and preparation for commercialization and entrepreneurship ---points to keep in mind as an engineer/researcher
3. from university research to commercialization/start-up --- how to proceed with R&D in a company
4. promotion of commercialization ---negotiations and market research for commercialization ----.
5. innovation theory
6. case studies in the mobility field
7. biotechnology and medical fields
8. case studies in the field of electronic devices
9. technology management (patents, etc.)
10. summary

A report will be assigned, so students should identify and discuss their own interests and issues while attending the lecture.

●Textbook
Distribute materials as appropriate.

●Additional Reading

●Grade Assessment
Evaluate based on self-made problem report Understanding the problems and solutions for startups that respond to the problems in the lecture is a criterion for success. The contents of the report are comprehensively evaluated, and a score of 60 or more is considered acceptable. New business proposals will be appreciated.

●Notes
Do not have any special requirements. We hope students who are interested in startups.

Important Notes
Students who wish to take the course will be able to register for the "Focus on Venture Business I" at NUCT after they have registered for the course.
Note that all contacts from NUCT are available for the lectures.
Students who missed the registration period should register the page of "Focus on Venture Business I" on the NUCT website.
In addition, all lectures will be conducted remotely using online conferencing tools.

●Contacting Faculty
the break after the lecture.

Focus on Venture Business II (2.0credits) (ベンチャービジネス特論II)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	
Lecturer	Manato DEKI Assistant Professor		

●Course Purpose

By referring to the examples of commercialization, in-company entrepreneurship and venture entrepreneurship given in the special lecture on venture business I, you study the specialized knowledge necessary for entrepreneurship and start-up from a public accountant, SME consultant, etc. Talks are held with specialists in Japan to acquire the knowledge needed for venture business management.

Lectures will be held in a discussion style.
As a part of this, the maximum number of registered students will be set at 60.
If the number of registered students exceeds 60, students will be selected by lottery. The number of students will be determined by lottery.
Students who wish to take this course should first register at NUCT.
Information on the lottery will be sent to applicants via the NUCT lecture website.

However, students enrolled in the "DII Collaborative Graduate Program for Accelerating Innovation in Future Electronics " may take the course without a lottery.

●Prerequisite Subjects

●Course Topics

1. the japanese economy and venture business
2. current status of venture business
Venture and management strategy
Venture and marketing strategy
Venture Business and Corporate Accounting
Venture and financial strategy
7. case studies (emphasis on management strategy)

8. case study (focus on marketing strategy)
9. case study (focus on financial strategy)
10. case study (focus on capital policy: IPO company)
11. business plan business idea and competitive advantage
Business Plan Profitability Plan
13. business plan financial plan
Business Plan Business Plan Operation and Summary
15. summary

It is necessary for future businesses to research and understand various literature and online information regarding the lecture content.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

Lectures will be held in a discussion style.
As a part of this, the maximum number of registered students will be set at 60.
If the number of registered students exceeds 60, students will be selected by lottery. The number of students will be determined by lottery.
Students who wish to take this course should first register at NUCT.
Information on the lottery will be sent to applicants via the NUCT lecture website.

However, students enrolled in the "DII Collaborative Graduate Program for Accelerating Innovation in Future Electronics " may take the course without a lottery.

●Contacting Faculty

Internship A (1.0credits) (学外実習Ａ)

Course Type	Comprehensive engineering courses
Division at course	Master's Course
Class Format	Practice
Course Name	Materials Design Innovation Engineering
Starts 1	1 Spring and Autumn Semester
Lecturer	Associated Faculty

●Course Purpose
In the course of the internship program, students make research works concerning predetermined themes in research and developing sections of companies under the instructing staffs of the companies. Through the program, the students are expected to learn the practical ways of problem-setting and solving at the front of research and developing in the companies activities, and to have the wide knowledge of the practical aspects of the scientific and engineering fields they are studying in the university. Students learn collective strength and creativity.

●Prerequisite Subjects
Major subjects of the Department of Materials Design Innovation Engineering

●Course Topics
The theme of the student is determined under the agreement between the university and the company that cooperates in the internship program.

●Textbook
We will introduce as needed.

●Additional Reading
We will introduce as needed.

●Grade Assessment
Evaluation of the attainment of the student is made by the instructors of the company. Oral presentation and written report of the research results are also evaluated by the university staffs and company instructors.

●Notes
There is no requirement to take this course.

●Contacting Faculty
We will explain as needed.

Internship B (1.0credits) (学外実習Ｂ)

Course Type	Comprehensive engineering courses
Division at course	Master's Course
Class Format	Practice
Course Name	Materials Design Innovation Engineering
Starts 1	1 Spring and Autumn Semester
Lecturer	Associated Faculty

●Course Purpose
In the course of the internship program, students make research works concerning predetermined themes in research and developing sections of companies under the instructing staffs of the companies. Through the program, the students are expected to learn the practical ways of problem-setting and solving at the front of research and developing in the companies activities, and to have the wide knowledge of the practical aspects of the scientific and engineering fields they are studying in the university. Students learn collective strength and creativity.

●Prerequisite Subjects
Major subjects of the Department of Materials Design Innovation Engineering

●Course Topics
The theme of the student is determined under the agreement between the university and the company that cooperates in the internship program.

●Textbook
We will introduce as needed.

●Additional Reading
We will introduce as needed.

●Grade Assessment
Evaluation of the attainment of the student is made by the instructors of the company. Oral presentation and written report of the research results are also evaluated by the university staffs and company instructors.

●Notes
There is no requirement to take this course.

●Contacting Faculty
We will explain as needed.

Advanced Mobility Program Basic Course (4.0credits) (先進モビリティ学基礎)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture and Exercise		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
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	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	1 Spring Semester
	1 Spring Semester	1 Spring Semester	
Lecturer	Tatsuya SUZUKI Professor	Takeshi KATAKAI Designated Associate Professor	JIANG Meilan Designated Lecturer
	Eiji ABE Assistant Professor	Faculty of Advanced Mobility Program	

●Course Purpose

To train students who can be active in the mobility industry or research institute. This course is aiming to cultivate comprehensive knowledge not only on specialized technical elements but also service and social impact of the mobility. The class will be provided not only by professors but also by engineers in industry. The course is organized as follows:

1. Understand fundamentals of automobile
2. Understand the trend on electrification of automobile
3. Understand the trend on on intelligence for automobile
4. Understand dependability, safety and human factor
5. Comprehensively study the mobility service
6. Comprehensively study the legal system for mobility

●Prerequisite Subjects

Accepted basic engineering classes at Nagoya University Bachelor's degree, or equivalent knowledge.

●Course Topics

1. Fundamentals of automobile
2. Electrification of automobile
3. Intelligence for automobile
4. Dependability, safety and human factor
5. Mobility service
6. Legal system for mobility
7. Discussion and presentation

Read carefully the textbook before attending each class. After each class, solving the exercises in the textbook is highly recommended. Submission of the report after each class is mandatory.

●Textbook

Original lecture note will be provided.

●Additional Reading

It will be announced in the class if necessary.

●Grade Assessment

Evaluation is based on total score of reports at each class and final presentation. You need more than mark of 60 out of 100 points. Special certificate will be provided for passed students.

●Notes

No particular requirement.

●Contacting Faculty

Mail to:katakai@coi.nagoya-u.ac.jp

bility Program Practical Training Course(Electric Autonomous Vehicle) (2.0credits) (先進モビリティ学実習（EV自

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	
Lecturer	Tatsuya SUZUKI Professor	Takeshi KATAKAI Designated Associate Professor	JIANG Meilan Designated Lecturer
	Eiji ABE Assistant Professor	Faculty of Advanced Mobility Program	

●Course Purpose

To train the students who can play an active role in the mobility industry or research institute. To provide break down study on the EV using commercial electric vehicles and a university formula car. After understanding the mechanism of the EV structure, to produce a mini car for automatic driving. Students themselves will build a software system that realizes a basic automatic driving such as lane tracking. This course is organized as follows:1. Learn the basics of technological development in the mobility industry2. Understand the structure and driving mechanism of electric vehicles3. Understanding autonomous driving technology through the production of a mini cars for autonomous driving4. Understand the software architecture for autonomous driving5. Understand cognition technology for lane detection / follow-up control and on-board installation6. Understand control technology for obstacle detection / avoidance and on-board installation

●Prerequisite Subjects

Accepted basic engineering classes at Nagoya University Bachelor's degree, or equivalent knowledge.

●Course Topics

After experiencing the break down study using commercial EV and an electric formula car, produce a mini car for autonomous driving and develop autonomous driving algorithm. After learning the basic movements of running, turning, and stopping, develop lane tracing algorithm to follow the white line by image recognition. A contest will be held at the end of the training. A special certificate will be issued to students who have completed the prescribed grades in this course. The content of the class is as follows.1. Electric vehicle structure and running mechanism2. Vehicle characteristic analysis and improvement methods3. Examination of software architecture for autonomous driving4. Understand and implement cognition technology for lane detection5. Understand and implement control technology for follow-up control6. Understand control technology for obstacle detection / avoidance

●Textbook

Original lecture note will be provided.

●Additional Reading

It will be announced in the class if necessary.

●Grade Assessment

Evaluation is based on the student's effort for solving the tasks, total score of reports, and final presentation. You need more than mark of 60 out of 100 points. Special certificate will be provided for passed students.

●Notes

No particular requirement.

●Contacting Faculty

Mail to:katakai@coi.nagoya-u.ac.jp

Advanced Lectures on Transdisciplinary Mobility Innovation I (2.0credits) (超学際移動イノベーション学特論 I)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	
Lecturer	Toshiyuki YAMAMOTO Professor	Faculty of TMI Program	

●Course Purpose

Through the lectures on various super-interdisciplinary mobility innovations for life-style transformation, learn the impacts and changes of life-style caused by the mobility innovations.
The ability to understand the mobility innovations from various perspectives, and to implement them based on the understandings from various disciplines are required to realize the life-style transformations by mobility innovations. The purposes of this class is to obtain the ability as below.
- understand the mobility innovations from various disciplines
- analyze the effects of and forecast the future of mobility innovations

●Prerequisite Subjects

Not required

●Course Topics

Through the lectures on super-interdisciplinary mobility innovations and life-style transformation, various environments and implementations of cutting-edge mobility innovations are discussed.

1. History of technologies on mobility
2. Service design of mobility
3. Product design theory
4. Mobility innovations and diversity
5. Theory on inclusive mobility

Report assignments on the contents explained in the lecture are given.

●Textbook

Materials are provided at classes.

●Additional Reading

Introduced according to the process of the lecture.

●Grade Assessment

Evaluated by reports.

●Notes

Not required.

●Contacting Faculty

Ask questions in the class. There are no fixed schedules for office hour. Make an appointment by e-mail or tel.

Yamamoto: 4636, yamamoto@civil.nagoya-u.ac.jp

Advanced Lectures on Transdisciplinary Mobility Innovation II (2.0credits) (超学際移動イノベーション学特論II)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	1 Autumn Semester
	1 Autumn Semester	1 Autumn Semester	
Lecturer	Toshiyuki YAMAMOTO Professor	Faculty of TMI Program	

●Course Purpose

Through the practical lectures on various super-interdisciplinary mobility innovations for life-style transformation, learn more the impacts and changes of life-style caused by the mobility innovations.
The ability to understand the mobility innovations from various perspectives, and to implement them based on the understandings from various disciplines are required to realize the life-style transformations by mobility innovations. The purposes of this class is to obtain the ability as below.
- understand comprehensively the mobility innovations from various disciplines
- analyze deeper the effects of and forecast the future of mobility innovations

●Prerequisite Subjects

Advanced super-interdisciplinary mobility innovation I

●Course Topics

Through the lectures on more diverse super-interdisciplenary mobility innovations and life-style transformation, various environments and implementations of cutting-edge mobility innovations are discussed.

1. Cutting-edge mobility system
2. Ergonomics
3. Mobility and cognitive science
4. Mobility and society
5. Law and institutional design fro mobility

Report assignments on the contents explained in the lecture are given.

●Textbook

Materials are provided at classes.

●Additional Reading

Introduced according to the process of the lecture.

●Grade Assessment

Evaluated by reports.

●Notes

Not required.

●Contacting Faculty

Ask questions in the class. There are no fixed schedules for office hour. Make an appointment by e-mail or tel.

Yamamoto: 4636, yamamoto@civil.nagoya-u.ac.jp

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Associated Faculty		

●Course Purpose

• To design and conduct an original research project
• To develop experience with experimental/numerical/theoretical techniques
• To develop a working knowledge of relevant research literature
• To practice scientific writing and participate in the peer review process
• To be able to discuss the research and topic with other scientists and engineers
The objective of this project is to increase the capability to find and to solve research problems by learning the research approaches and ideas of different research fields.

●Prerequisite Subjects

Basic engineering subjects, English, Technical English

●Course Topics

• Students will develop (with guidance) a research project proposal at the beginning of the semester that will provide initiative, outline and experimental strategy.
• Each student will present oral reports of research progress, relevant readings, and/or challenges at scheduled lab meetings.
• Students will take primary responsibility for conducting research and do so with professional attitudes and time commitments. This is a lab course and you are expected to spend a minimum of 20 hours of productive lab work per week. It is more realistic to expect to spend an average of 25-30 hours per week working and thinking about your project.
• Students will produce a manuscript (with active feedback from the instructor and peers) that can be published in part or whole by a peer reviewed research journal. Publishable manuscripts require many drafts,

reviews, and revisions.
• Students are encouraged to present research results at appropriate scientific meetings.
• Students well be self-motivated and work independently, approaching the instructor for guidance regularly.

●Textbook
Will be designated by each supervisor.

●Additional Reading
Will be designated by each supervisor.

●Grade Assessment
The grade will be calculated according to the following criteria.
Written report following the same format as scientific paper... 50%; Presentation at the Workshop... 50%.
The acceptance standard is to understand the introduced research approaches and ideas.
Evaluation is done by the supervisor(s) at home and visiting universities.

●Notes
No conditions for taking the course.

●Contacting Faculty
Supervisor of visiting university basically takes care.

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Associated Faculty		

●Course Purpose

• To design and conduct an original research project
• To develop experience with experimental/numerical/theoretical techniques
• To develop a working knowledge of relevant research literature
• To practice scientific writing and participate in the peer review process
• To be able to discuss the research and topic with other scientists and engineers
The objective of this project is to increase the capability to find and to solve research problems by learning the research approaches and ideas of different research fields.

●Prerequisite Subjects

Basic engineering subjects, English, Technical English

●Course Topics

• Students will develop (with guidance) a research project proposal at the beginning of the semester that will provide initiative, outline and experimental strategy.
• Each student will present oral reports of research progress, relevant readings, and/or challenges at scheduled lab meetings.
• Students will take primary responsibility for conducting research and do so with professional attitudes and time commitments. This is a lab course and you are expected to spend a minimum of 20 hours of productive lab work per week. It is more realistic to expect to spend an average of 25-30 hours per week working and thinking about your project.
• Students will produce a manuscript (with active feedback from the instructor and peers) that can be published in part or whole by a peer reviewed research journal. Publishable manuscripts require many drafts,

reviews, and revisions.
• Students are encouraged to present research results at appropriate scientific meetings.
• Students well be self-motivated and work independently, approaching the instructor for guidance regularly.

●Textbook

Will be designated by each supervisor.

●Additional Reading

Will be designated by each supervisor.

●Grade Assessment

The grade will be calculated according to the following criteria.
Written report following the same format as scientific paper... 50%; Presentation at the Workshop... 50%.
The acceptance standard is to understand the introduced research approaches and ideas.
Evaluation is done by the supervisor(s) at home and visiting universities.

●Notes

No conditions for taking the course.

●Contacting Faculty

Supervisor of visiting university basically takes care.

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Associated Faculty		

●Course Purpose

• To design and conduct an original research project
• To develop experience with experimental/numerical/theoretical techniques
• To develop a working knowledge of relevant research literature
• To practice scientific writing and participate in the peer review process
• To be able to discuss the research and topic with other scientists and engineers
The objective of this project is to increase the capability to find and to solve research problems by learning the research approaches and ideas of different research fields.

●Prerequisite Subjects

Basic engineering subjects, English, Technical English

●Course Topics

• Students will develop (with guidance) a research project proposal at the beginning of the semester that will provide initiative, outline and experimental strategy.
• Each student will present oral reports of research progress, relevant readings, and/or challenges at scheduled lab meetings.
• Students will take primary responsibility for conducting research and do so with professional attitudes and time commitments. This is a lab course and you are expected to spend a minimum of 20 hours of productive lab work per week. It is more realistic to expect to spend an average of 25-30 hours per week working and thinking about your project.
• Students will produce a manuscript (with active feedback from the instructor and peers) that can be published in part or whole by a peer reviewed research journal. Publishable manuscripts require many drafts,

reviews, and revisions.
• Students are encouraged to present research results at appropriate scientific meetings.
• Students well be self-motivated and work independently, approaching the instructor for guidance regularly.

●Textbook

Will be designated by each supervisor.

●Additional Reading

Will be designated by each supervisor.

●Grade Assessment

The grade will be calculated according to the following criteria.
Written report following the same format as scientific paper... 50%; Presentation at the Workshop... 50%.
The acceptance standard is to understand the introduced research approaches and ideas.
Evaluation is done by the supervisor(s) at home and visiting universities.

●Notes

No conditions for taking the course.

●Contacting Faculty

Supervisor of visiting university basically takes care.

Seminars on Computational Materials Design 2A (2.0credits) (計算材料設計セミナー２Ａ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

This seminar aims to cultivate creativity and a spirit of challenge to build a new field of materials engineering as a doctoral student through advanced training.
The goal of this seminar is as follows:

1. Students can give oral presentations on original researches on new mechanisms and designs of materials properties.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.
Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (question and answer) in seminar: 50%
Presentation and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2A (2.0credits) (計算材料設計セミナー２Ａ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit to construction a new field of materials science and engineering. The goal of this seminar are as follows.1. Every student is requested to do oral presentation of the new or original study on materials microstructure design.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2A (2.0credits) (計算材料設計セミナー２Ａ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose
We give future themes and small themes related to the doctoral dissertation, and prepare their own answers to improve the expertise in the specialized field and provide training to demonstrate originality. :
Achievement goal: Oral presentation of material structure design that is rich in novelty and originality.

●Prerequisite Subjects

●Course Topics
Advanced handling of 3D material structure and property analysis

After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook
Instructions will be given according to the progress of the lecture.

●Additional Reading
Instructions will be given according to the progress of the lecture.

●Grade Assessment
Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.

Students (2020~)
100959480797069656460 59 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty
e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2B (2.0credits) (計算材料設計セミナー２Ｂ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

This seminar aims to cultivate creativity and a spirit of challenge to build a new field of materials engineering as a doctoral student through advanced training.
The goal of this seminar is as follows:
1. Students can give oral presentations on original researches on new mechanisms and designs of materials properties.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.
Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (question and answer) in seminar: 50%
Presentation and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2B (2.0credits) (計算材料設計セミナー２Ｂ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit to construction a new field of materials science and engineering. The goal of this seminar are as follows.1. Every student is requested to do oral presentation of the new or original study on materials microstructure design.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2B (2.0credits) (計算材料設計セミナー２Ｂ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose

We give future themes and small themes related to the doctoral dissertation, and prepare their own answers to improve the expertise in the specialized field and provide training to demonstrate originality. :
Achievement goal: Oral presentation of material structure design that is rich in novelty and originality.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.

Students (2020~)
1009594807970696564 6059 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty

adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2C (2.0credits) (計算材料設計セミナー２Ｃ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

This seminar aims to cultivate creativity and a spirit of challenge to build a new field of materials engineering as a doctoral student through advanced training.The goal of this seminar is as follows:1. Students can give oral presentations in English on the novel and original researches on materials design in the field of computational materials science.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar: 50%Presentation and discussion: 50%Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".Faculty in charge:kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2C (2.0credits) (計算材料設計セミナー２Ｃ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit to construction a new field of materials science and engineering. The goal of this seminar are as follows.1. Every student is requested to do oral presentation in English on the novel and original materials design in the field of computational materials science and engineering.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2C (2.0credits) (計算材料設計セミナー２Ｃ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose

We give future themes and small themes related to the doctoral dissertation, and prepare their own answers to improve the expertise in the specialized field and provide training to demonstrate originality. :
Achievement goal: Oral presentation of material structure design that is rich in novelty and originality.

●Prerequisite Subjects

●Course Topics

After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

Instructions will be given according to the progress of the lecture.

●Additional Reading

Instructions will be given according to the progress of the lecture.

●Grade Assessment

Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.

Students (2020~)
1009594807970696564 6059 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty

e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2D (2.0credits) (計算材料設計セミナー２Ｄ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

This seminar aims to cultivate creativity and a spirit of challenge to build a new field of materials engineering as a doctoral student through advanced training.
The goal of this seminar is as follows:
1. Students can give oral presentations in English on the novel and original researches on materials design in the field of computational materials science.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.
Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).
E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).
D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:
Attendance and attitude (question and answer) in seminar: 50%
Presentation and discussion: 50%
Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".

Faculty in charge:
kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2D (2.0credits) (計算材料設計セミナー２Ｄ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit to construction a new field of materials science and engineering. The goal of this seminar are as follows.1. Every student is requested to do oral presentation in English on the novel and original materials design in the field of computational materials science and engineering.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2D (2.0credits) (計算材料設計セミナー２Ｄ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose
We give future themes and small themes related to the doctoral dissertation, and prepare their own answers to improve the expertise in the specialized field and provide training to demonstrate originality. :
Achievement goal: Oral presentation of material structure design that is rich in novelty and originality.

●Prerequisite Subjects

●Course Topics
After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook
Instructions will be given according to the progress of the lecture.

●Additional Reading
Instructions will be given according to the progress of the lecture.

●Grade Assessment
Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.

Students (2020~)
10095948079706965646059 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty
e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2E (2.0credits) (計算材料設計セミナー２Ｅ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	3 Spring Semester	
Lecturer	Hajime KIMIZUKA Professor	Hiroshi YUKAWA Assistant Professor

●Course Purpose

This seminar aims to cultivate creativity and a spirit of challenge to build a new field of materials engineering as a doctoral student through advanced training.The goal of this seminar is as follows:1. Students can give oral presentations and discussions in English on the novel and original researches on materials design in the field of computational materials science.

●Prerequisite Subjects

Basics of Design Engineering on Electronic Structures and Functions

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of modeling and simulation in materials science

●Textbook

Textbooks are not used. Handouts will be provided as needed.

●Additional Reading

D. Raabe, Computational Materials Science (Wiley-VCH, 1998).E. Kaxiras, Atomic Electronic Structure Solids (Cambridge Univ. Press, 2003).D. Frenkel and B. Smit, Understanding Molecular Simulation: From Algorithms to Applications (Academic Press, 2002).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar: 50%Presentation and discussion: 50%Students can earn credits if they can properly deal withbasic problems. If students can handle more difficult problems, they will get better grades.

●Notes

There is no requirement to take this course.

●Contacting Faculty

Questions to the faculty should be directed to the NUCT function "Message".Faculty in charge:kimizuka.hajime[at]material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2E (2.0credits) (計算材料設計セミナー２Ｅ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	3 Spring Semester	
Lecturer	Toshiyuki KOYAMA Professor	Yuhki TSUKADA Associate Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit to construction a new field of materials science and engineering. The goal of this seminar are as follows.1. Every student is requested to do oral presentation and discussions in English on the novel and original materials design in the field of computational materials science and engineering.

●Prerequisite Subjects

Introduction to Computational Materials Design

●Course Topics

Presentations in turn.Subject: Fundamentals and applications of phase-field method

●Textbook

T.Koyama and T.Takaki: Introduction to phase-field method, Maruzen, (2013).

●Additional Reading

T.Koyama: Computational materials design - Computational phase transformations -, Uchoda Roukakuho Publishing Co. Ltd., (2019).T.Abe: Computational materials design - Computational thermodynamics -, Uchoda Roukakuho Publishing Co. Ltd., (2019), T. Nishizawa: Thremodynamics for microstructures, Japan Institute of Metals, (2005).

●Grade Assessment

Your overall grade in the seminar will be decided based on the following:Attendance and attitude (question and answer) in seminar:50%, Presentation and discussions: 50%, Pass the examination if the basic problem can be dealt with reasonably, and if it can handle the more advanced problem, reflect it in the grade accordingly.

●Notes

No registration requirements.Classes will be conducted in combination with face-to-face and remote (on-demand type) (depending on the situation, it may be only remote).Remote lecture will be conducted at ZOOM, and the lecture handouts will be shared through NUCT.Ask questions to teachers using the NUCT function "Message".The NUCT function "Message" can be used to exchange opinions among students.

●Contacting Faculty

Recess after a seminar, or office hours (contact by e-mail or through the NUCT function "Message").Contact: Toshiyuki Koyamae-mail: koyama@material.nagoya-u.ac.jp

Seminars on Computational Materials Design 2E (2.0credits) (計算材料設計セミナー２Ｅ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	3 Spring Semester	
Lecturer	Yoshitaka ADACHI Professor	Toshio OGAWA Lecturer

●Course Purpose

We give future themes and small themes related to the doctoral dissertation, and prepare their own answers to improve the expertise in the specialized field and provide training to demonstrate originality. :
Achievement goal: Oral presentation of material structure design that is rich in novelty and originality.

●Prerequisite Subjects

●Course Topics

After-hours study: Reading relevant papers that the faculty introduced or voluntarily searched for, and working to understand the main points.

●Textbook

Instructions will be given according to the progress of the lecture.

●Additional Reading

Instructions will be given according to the progress of the lecture.

●Grade Assessment

Students must get the total score as shown below based on each scores of Exercises (quiz) and a couple of examinations (will be carried out) in this course.

Students (2020~)
1009594807970696564 6059 or below
Students(~2019)
1009089807970696059 or below

●Notes

●Contacting Faculty

e-mail etc.
adachi.yoshitaka[at]material.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 2A (2.0credits) (先端計測分析セミナー２Ａ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own4. To plan research subject and to obatin ability to solve it by myself

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 2A (2.0credits) (先端計測分析セミナー２Ａ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Spring Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 2B (2.0credits) (先端計測分析セミナー２Ｂ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own4. To plan research subject and to obatin ability to solve it by myself

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 2B (2.0credits) (先端計測分析セミナー２Ｂ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Autumn Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 2C (2.0credits) (先端計測分析セミナー２Ｃ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own4. To plan research subject and to obatin ability to solve it by myself

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 2C (2.0credits) (先端計測分析セミナー２Ｃ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Spring Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 2D (2.0credits) (先端計測分析セミナー２Ｄ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own4. To plan research subject and to obatin ability to solve it by myself

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 2D (2.0credits) (先端計測分析セミナー２Ｄ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Autumn Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Advanced Measurement and Analysis 2E (2.0credits) (先端計測分析セミナー２Ｅ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	3 Spring Semester	
Lecturer	Takahisa YAMAMOTO Professor	Tomoharu TOKUNAGA Assistant Professor

●Course Purpose

Understand the broad background of material evaluation and analysis technique based on transmission electron microscopy, and learn the research methods that will link it to material development.By learning this lecture, the goal is to be able to:1. To understand the basics of transmission electron microscopy and solve various microstructural analysis issues based on it.2. To interpret the functions of the material based on the microstructure analysis of the material.3. To acquire the concept of solving problems on your own4. To plan research subject and to obatin ability to solve it by myself

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Advanced Measurement and Analysis 2E (2.0credits) (先端計測分析セミナー２Ｅ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	3 Spring Semester		
Lecturer	Yoshifumi TAKASHIMA Professor	Takahiro ITOH Associate Professor	RaiKAKU Assistant Professor

●Course Purpose

[Accelerator Science] To understand physics of electron accelerators as a synchrotron radiation source, relating papers will be read in turn. [Material Science] To understand anomalous electronic/magnetic properties of functional materials by utilizing a synchrotron photoemission spectroscopy, relating papers will be read in turn.

●Prerequisite Subjects

Mechanics, ElectrodynamicsQuantum mechanicsSolid state physics

●Course Topics

[Accelerator Science] 1. Special relativity:2. Accelerator physics:3. Generation of electromagnetic waves from high energy electrons [Material Science] 1. Material Science:2. Synchrotron photoemission engineering

●Textbook

Textbooks are selected as needed.

●Additional Reading

Reference books will be introduced as needed.

●Grade Assessment

Oral Examination and Reports

●Notes

●Contacting Faculty

[Accelerator science] takasima@nusr.nagoya-u.ac.jp[Material Science] t.ito@nusr.nagoya-u.ac.jp

Seminars on Nanostructure Design 2A (2.0credits) (ナノ構造設計セミナー２Ａ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Spring Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 2A (2.0credits) (ナノ構造設計セミナー２Ａ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Spring Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1.understand the basics of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structural Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi HaradaExt.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki Yukawa Ext.3572yukawa@nagoya-u.jp
Eiji AbeExt.3578abe.eiji@material.nagoya-u.ac.jp

Seminars on Nanostructure Design 2B (2.0credits) (ナノ構造設計セミナー２Ｂ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	1 Autumn Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 2B (2.0credits) (ナノ構造設計セミナー２Ｂ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	1 Autumn Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1.understand the basics of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structural Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi HaradaExt.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki Yukawa Ext.3572yukawa@nagoya-u.jp
Eiji AbeExt.3578abe.eiji@material.nagoya-u.ac.jp

Seminars on Nanostructure Design 2C (2.0credits) (ナノ構造設計セミナー２Ｃ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Spring Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 2C (2.0credits) (ナノ構造設計セミナー２Ｃ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Spring Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1.propose the new idea under the basis of understanding of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structural Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi HaradaExt.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki Yukawa Ext.3572yukawa@nagoya-u.jp
Eiji AbeExt.3578abe.eiji@material.nagoya-u.ac.jp

Seminars on Nanostructure Design 2D (2.0credits) (ナノ構造設計セミナー２Ｄ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	2 Autumn Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 2D (2.0credits) (ナノ構造設計セミナー２Ｄ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	2 Autumn Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1.propose the new idea under the basis of understanding of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structural Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi Harada Ext.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki YukawaExt.3572yukawa@nagoya-u.jp
Eiji Abe Ext.3578abe.eiji@material.nagoya-u.ac.jp

Seminars on Nanostructure Design 2E (2.0credits) (ナノ構造設計セミナー２Ｅ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Design Innovation Engineering	
Starts 1	3 Spring Semester	
Lecturer	Yasutoshi IRIYAMA Professor	Norikazu ISHIGAKI Assistant Professor

●Course Purpose

Students read articles in this field with the aim of deepening the basic concepts and understanding of solid state ionics and energy conversion/storage materials. In addition, students will learn how to understand English sentences logically based on the concept of paragraph structure required for how to construct English thesis of science and technology papers.Aims of this classBy learning this seminar, students will be able to:1. Gain the ability to read and understand the logic of scientific papers based on the paragraph structure.2. Understand basic knowledge and advanced research trends in this research field.3. Organize and summarize the current position of research.4. Gain the ability to cultivate creativity in unexplored research areas and then quest to confront it.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminars on Nanostructure Design 2E (2.0credits) (ナノ構造設計セミナー２Ｅ)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Design Innovation Engineering		
Starts 1	3 Spring Semester		
Lecturer	Hiroshi HARADA Professor	Nobuki YUKAWA Associate Professor	Eiji ABE Assistant Professor

●Course Purpose

Learn how to conduct, summarize, and present research on recent research and technical issues related to materials processing by reading domestic and foreign research papers.
The objective of this course is to be able to:
1.propose the new idea under the basis of understanding of material flow, phase transformation, plastic deformation, process design, and condition optimization.

●Prerequisite Subjects

Metallic Materials, Mechanics of Materials, Strength of Materials, Plasticity of Materials, Structural Materials, Fluid Dynamics, Transport Phenomena

●Course Topics

Flow and plasticity of continuum, Properties of work material, Solidification of metal, Flow instability, Machining limit, Various machining methods, Application of CAD/CAM/CAE, Application of FEM, New mathematical modeling

●Textbook

Metal Forming and the Finite-Element Method: S. Kobayashi et al, Oxford Univ. Press
Transport Phenomena in Metallurgy: G.H.Geiger and D.R.Poirier, Addison-Wesley Publishing Company
Fundamentals of Solidification: W.Kurz and D.J.Fisher, Trans Tech Publications

●Additional Reading

We will introduce them appropriately as the lecture progresses.

●Grade Assessment

Presentations, and Reports.
The degree of achievement for the achievement target is evaluated by reports and presentations.
“Pass” is given to the student who is able to correctly understand the basic issues with respect to the items shown in the class contents,For the student who is able to understand more difficult questions, reflect them on the grade according to the level and results of the questions.

●Notes

●Contacting Faculty

Hiroshi Harada Ext.5307harada.hiroshi@material.nagoya-u.ac.jp
Nobuki YukawaExt.3572yukawa@nagoya-u.jp
Eiji Abe Ext.3578abe.eiji@material.nagoya-u.ac.jp

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by studying in an abroad laboratory and learn different methods and ways of thinking, as well as communicate on a daily base with foreign researchers.

By completing the course, the students are expected to acquire various research methods and ways of thinking, gain the ability to tackle research problems from multiple angles, and acquire a broad international perspective.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject, English, Advanced Lectures on Scientific English

●Course Topics

Students will stay in an abroad laboratory that will be chosen based on the participant’s research field and interest. The course consists of the following contents.

1. Theme setting and literature review
2. Formulating a research plan
3. Analyzing the results and discussion
4. Presentation of the results

After the class, students should review the analyzing processes of the research results and investigate related literatures.

●Textbook
Will be introduced at the host laboratory depending on the research subject

●Additional Reading
Will be introduced at the host laboratory if necessary

●Grade Assessment
Conducting research in an abroad laboratory for one semester and submitting a report is a prerequisite. Evaluation will be based on the student's report (50%) and oral presentation (50%). To pass, the students have to demonstrate that they have the capacity to adequately analyze the results and have acquired the basic knowledge to interpret the results.

●Notes

●Contacting Faculty
Questions will be answered by the supervisors at the host laboratory during the course.

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by studying in an abroad laboratory and learn different methods and ways of thinking, as well as communicate on a daily base with foreign researchers.

By completing the course, the students are expected to acquire various research methods and ways of thinking, gain the ability to tackle research problems from multiple angles, and acquire a broad international perspective.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject, English, Advanced Lectures on Scientific English

●Course Topics

Students will stay in an abroad laboratory that will be chosen based on the participant’s research field and interest. The course consists of the following contents.

1. Theme setting and literature review
2. Formulating a research plan
3. Analyzing the results and discussion
4. Presentation of the results

After the class, students should review the analyzing processes of the research results and investigate related literatures.

●Textbook
Will be introduced at the host laboratory depending on the research subject

●Additional Reading
Will be introduced at the host laboratory if necessary

●Grade Assessment
Conducting research in an abroad laboratory for two semesters and submitting a report is a prerequisite. Evaluation will be based on the student's report (50%) and oral presentation (50%). To pass, the students have to demonstrate that they have the capacity to adequately analyze the results and have acquired the basic knowledge to interpret the results.

●Notes

●Contacting Faculty
Questions will be answered by the supervisors at the host laboratory during the course.

Teaching and Instruction Exercise 1 (1.0credits) (実験指導体験実習1)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

While attendance is raw, in "the innovation experience project," I stand with a company engineer (DP, Directing Professor) and carry an assistance, DP of the attendance straight instruction by the DP and the role of the interface of the attendance student. In this way, it is intended to let you do experience of the project management.

I aim for planning a researcher, improvement of the nature as the leader, the expansion of the field of vision by a simulated experience of instruction of the attendance life and the business management in the real world.

●Prerequisite Subjects

"Innovation Practice Course" 75 hours(Principle one day a week)

●Course Topics

In "the innovation experience project," I assist the project promotion by the DP.

Help of the understanding of a project theme and contents for the attendance life of various specialisms

I compile an opinion of the attendance life and let you make a purpose, the method of the project clear

Exchange of opinions between the attendance life, instruction, report of the discussion

Communication adjustment that DP and attendance are raw

I assume this a main component.

In addition, correspondence out of the lecture time is necessary when preparations, an investigation to affect project accomplishment are necessary.

●Textbook

Papers, books and/or documents that the lecturer (DP) will introduce.

●Additional Reading

Papers, books and/or documents that the lecturer (DP) will introduce.

●Grade Assessment

I evaluate it through accomplishment, the discussion of the project. If display of leadership, report ability and the leadership is accepted, it is said that I pass.

●Notes

No specific requirements.

●Contacting Faculty

The lecturer (DP) and the project staff of the university accept questions at any time.

Teaching and Instruction Exercise 2 (1.0credits) (実験指導体験実習2)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Manato DEKI Associate Professor		

●Course Purpose

The purpose of this course is to provide guidance to semester students for advanced science and engineering experiments at the Venture Business Laboratory. Through this research guidance, students will be able to play a comprehensive role as a researcher / educator and instructor in the field in charge of device process system and device simulation, and will be able to provide research guidance. Useful for practical training as a research leader.

●Prerequisite Subjects

Knowledge of the field in charge selected from the fields of electronic device process system and device simulation.

●Course Topics

In the student experiment, the instructor students provide guidance to attendant students on subject research and original research from the field of electronic device process system and device simulation with the professional teacher. Together with the attendant students, they perform practical use these equipment and software and get the results. They experience the leadership of the research, providing research guidance, report preparation guidance, and presentation guidance.

●Textbook

Required documents is distributed.

●Additional Reading

Required documents is distributed.

●Grade Assessment

Evaluate by compiling experiments / exercises, teaching (70%), and interviewing (30%). Students who understand each device and software and give appropriate guidance are accepted, and their research results and new approaches are highly evaluated. A score of 60 or more out of 100 is a passing score.

●Notes

To have a deep understandinginonefieldfromelectronic device process and device simulation.

●Contacting Faculty

Arranging the schedules by e-mail and etc.

Research Internship2 U2 (2.0credits) (研究インターンシップ２ U2)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

Students attending Research Internship are strongly recommended to take short-term Patent Laws and Focus on Venture Business I or II before the attendance.

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days less than or equal to 20 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U3 (3.0credits) (研究インターンシップ２ U3)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

Students attending Research Internship are strongly recommended to take short-term Patent Laws and Focus on Venture Business I or II before the attendance.

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days between 21 and 40 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U4 (4.0credits) (研究インターンシップ２ U4)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

Students attending Research Internship are strongly recommended to take short-term Patent Laws and Focus on Venture Business I or II before the attendance.

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days between 41 and 60 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U6 (6.0credits) (研究インターンシップ２ U6)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

Students attending Research Internship are strongly recommended to take short-term Patent Laws and Focus on Venture Business I or II before the attendance.

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days between 61 and 80 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U8 (8.0credits) (研究インターンシップ２ U8)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Practice		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	Materials Design Innovation Engineering
	Materials Process Engineering	Chemical Systems Engineering	Electrical Engineering
	Electronics	Information and Communication Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	Department of Energy Engineering
	Department of Applied Energy	Civil and Environmental Engineering	
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
	1 Spring and Autumn Semester	1 Spring and Autumn Semester	
Lecturer	Shinji DOKI Professor		

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

Students attending Research Internship are strongly recommended to take short-term Patent Laws and Focus on Venture Business I or II before the attendance.

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Additional Reading

Papers, books and/or documents that the staff instructing the training in the company will introduce.

●Grade Assessment

The credits will be given to the students who have had the working days more than or equal to 81 daysin the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.