Fundamentals of Physical Chemistry (2.0credits) (物理化学基礎論)

Course Type	Basic Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
Starts 1	Spring Semester ,every other year	Spring Semester ,every other year	Spring Semester ,every other year
Lecturer	Atsushi Satsuma Professor	Tsukasa TORIMOTO Professor	Koichi KIKUTA Professor
	Jun KUMAGAI Associate Professor	TatsuyaKAMEYAMA Associate Professor	Kyoichi SAWABE Lecturer

●Course Purpose

This lecture aims to be a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. In the lectures, we will improve our basic knowledge in physical chemistry. The course is aimed to understand the principle and to attain the applicability of thermodynamics, chemical reaction kinetics, quantum chemistry, etc. which are necessary in various fields as the basis of Physical Chemistry.

●Prerequisite Subjects

Thermodynamics, quantum chemistry, chemical kinetics, structural chemistry, electrochemistry, catalysis/surface chemistry, inorganic and physical chemistry exercises, photochemistry, radiation chemistry, polymer physical chemistry

●Course Topics

This is an omnibus-style class including the following contents in the field of graduate-level physical chemistry related to thermodynamics, chemical reactions, and quantum mechanics.
1. Mechanism and surface of catalytic reaction, various catalysts
2. Industrial use of catalysts
3. Basics of statistical mechanics
4. Molecular Dynamics Method II
5. Quantum chemical calculations
6. Basics of Electrochemistry and Photoelectrochemistry
7. Design and application of nanomaterials
8 Light absorption and emission by organic molecules
9 Characteristics and mechanism of photochemical reaction
10. Photochemical reaction and material chemistry
Prepare for the next class and understand the meaning of technical terms.

●Textbook

In case of necessity, printed handouts will be distributed in each lecture.

●Additional Reading

Textbooks and papers are designated for each week.

●Grade Assessment

Credits will be awarded to those students who score 60 or more based on the evaluation of academic achievements. The academic achievement is evaluated by examination, report, quiz or by their combination. A correct understanding of the basic concepts and terms related to physical chemistry is the criterion for passing.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher via NUCT message.

●Contacting Faculty

Do not hesitate to ask any questions during the class, or to have an appointment with each lecturer by e-mail.
satsuma@chembio.nagoya-u.ac.jp(Satsuma)
torimoto@chembio.nagoya-u.ac.jp(Torimoto)
kik@chembio.nagoya-u.ac.jp(Kikuta)
w.shinoda@chembio.nagoya-u.ac.jpShinoda
kumagai@chembio.nagoya-u.ac.jpKumagai
sawabe@chembio.nagoya-u.ac.jpSawabe

Fundamentals of Solide State Chemistry (2.0credits) (固体化学基礎論)

Course Type	Basic Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
Starts 1	Spring Semester ,every other year	Spring Semester ,every other year	Spring Semester ,every other year
Lecturer	Ryoutarou MATSUDA Professor	Chikara OHTUKI Professor	OSADA Minoru Professor
	NAKANISHI Kazuki Professor	KOBAYASHI Makoto Associate Professor	Joji HASEGAWA Designated Associate Professor
	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor	

●Course Purpose

The purpose of this course is to understand important contents of solid-state chemistry including inorganic chemistry, coordination chemistry, structural chemistry, inorganic material chemistry, and crystallography, in order to acquire the ability to develop new materials and substances that support a sustainable society.

In this course, the cutting-edge researchers will provide basic to the latest topics on energy-related materials, inorganic-organic hybrid materials, nanostructured materials, and biomaterials so that students will deepen understanding of these areas.

By the end of this course, students will be able to design new materials with a flexible idea, taking a bird's-eye view of the functions that solid materials manifest.

●Prerequisite Subjects

Fundamental Chemistry I, Fundamental Chemistry II, Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction (Inorganic Chemistry 3), and Inorganic Material Chemistry (Inorganic Chemistry 4), Analytical Chemistry 1 with Exercises, Analytical Chemistry 2 with Exercises, Analytical Chemistry 3, Physical Chemistry 1 with Exercises (Chemical Kinetics with Exercises), Physical Chemistry 2 with Exercises (Thermodynamics 1 with Exercises), Physical Chemistry 3 with Exercises (Quantum Chemistry 1 with Exercises), Physical Chemistry 4 with Exercises (Thermodynamics 2 with Exercises), Physical Chemistry 5 with Exercises (Quantum Chemistry 2 with Exercises), Physical Chemistry 6 (Energy and Theoretical Chemistry)

●Course Topics

Each faculty will give lectures in the omnibus style on solid-state chemistry, including inorganic chemistry, complex chemistry, structural chemistry, inorganic material chemistry, and crystallography. The topics include followings.

1. Energy-related (storage, conversion, etc.) materials
2. Inorganic-organic materials
3. Nanostructured materials
4. Nanoparticles
5. Biomaterials
6. Porous materials

Examinations or reports will be assigned after the classes.
References such as scientific papers will be provided in the classes for further reading.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

A. R. West: Solid State Chemistry, WILEY
William D. Callister Jr.: Materials Science and Engineering, Wiley

●Grade Assessment

Students should understand important contents of solid-state chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

In 2022, on-site lecture will be given.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the class. Otherwise, contact the professors by e-mail in advance.

Prof. Ryotaro Matsuda (ryotaro.matsuda[at]chembio.nagoya-u.ac.jp)
Prof. Chikara Ohtsuki (ohtsuki[at]chembio.nagoya-u.ac.jp)
Prof. Minoru Osada (mosada[at]imass.nagoya-u.ac.jp)
Prof. Kazuki Nakanishi (dknakanishi[at]imass.nagoya-u.ac.jp)
Assoc. Prof. George Hasegawa (h-george[at]imass.nagoya-u.ac.jp)
Assoc. Prof. Hiroaki Iguchi (hiroaki.iguchi[at]chembio.nagoya-u.ac.jp)
Assoc. Prof. Makoto Kobayashi (mkoba[at]imass.nagoya-u.ac.jp)

Fundamentals of Moleuclar and Macromolecular Chemistry (2.0credits) (有機・高分子化学基礎論)

Course Type	Basic Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
Starts 1	1 Spring Semester	1 Spring Semester	1 Spring Semester
Lecturer	Eiji YASHIMA Professor	MasamiKAMIGAITO Professor	Kazuaki ISHIHARA Professor
	Takashi OOI Professor	Hiroshi SHINOKUBO Professor	MakotoYAMASHITA Professor
	Atsushi TAKANO Associate Professor	Yukikazu Takeoka Associate Professor	UYANIK Muhammet Associate Professor
	Tomoyuki IKAI Associate Professor	Kosuke OMATSU Designated Associate Professor	Atsushi NORO Lecturer
	Mineto UCHIYAMA Lecturer		

●Course Purpose

We study fundamental topics related to organic chemistry and macromolecular chemistry including organic material chemistry, organoelement Chemistry, organic reactions, catalysis in organic synthesis, physical chemistry of polymers, organic chemistry of macromolecules, macromolecular assembly systems, and supramolecular polymer chemistry. The purpose of this lecture is to understand fundamental topic in organic and macromolecular chemistry for learning advanced chemistry, and to gain applied, comprehensive, bird's-eye view skills.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Fundamentals of Biomolecular Chemistry (2.0credits) (分子生命化学基礎論)

Course Type	Basic Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
Starts 1	Spring Semester ,every other year	Spring Semester ,every other year	Spring Semester ,every other year
Lecturer	Yoshinobu BABA Professor	Takao YASUI Associate Professor	Hiroshi MURAKAMI Professor
	HAYASHI Gosuke Associate Professor	Hiroyuki ASANUMA Professor	Hiromu KASHIDA Associate Professor
	Yukiko KAMIYA Associate Professor		

●Course Purpose

This course aims to help students acquire an understanding of basic knowledge and application about nanobio analytical chemistry, chemical biotechnology, and supramolecular biochemistry. This course introduces methodology relating to measurements and evaluation of substances from various points of view.

●Prerequisite Subjects

basic class of department of biomolecular engineering

●Course Topics

1. Nanobio analytical chemistry
2. Chemical biotechnology
3. Supuramolecular biochemistry

●Textbook

no textbook, handouts as necessary

●Additional Reading

●Grade Assessment

Your overall grade in the class will be decided based on the following:
- Attendance: 30%
- Report: 70%

●Notes

●Contacting Faculty

You may contact the teacher after his/her lecture.
Otherwise you may contact us by email.

Fundamentals of Biosystem Engineering (2.0credits) (生命システム工学基礎論)

Course Type	Basic Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
Starts 1	Spring Semester ,every other year	Spring Semester ,every other year	Spring Semester ,every other year
Lecturer	KIYONAKA Shigeki Professor	Hiroyuki HONDA Professor	Kazunori SHIMIZU Associate Professor
	Katsutoshi HORI Professor	Atuo SUZUKI Associate Professor	HajimeNAKATANI Lecturer

●Course Purpose

The purpose of this course is to analyze recent topics in Biosystems engineering fields from the basic and applied aspects and to discuss future developments from a engineer's standpoint.
By learning this lecture, the goal is to be able to:
1. Learn and explain recent topics in basics and applications in the field of biosystems engineering.
2. Give an opinion on the future development of this field based on sufficient awareness of the current situation.

●Prerequisite Subjects

Biochemistry with exercises 1-4, Biochemistry 5.
Fundamentals of Chemical Engineering.
Bioreaction Engineering.
Biological data science and engineering.

●Course Topics

1. Topics in drug development and regenerative medicine.
2. Topics in microbiology and applied microbiology.
3. Topics in chemical biology fields.

●Textbook

Text book will be introduced in the class.

●Additional Reading

Biochemistry, D. Voet & J. G. Voet, 4th Edition.
Biochemsiry, J.M. Berg, L. Stryer, J.L. Tymoczko & G.L. Gatto, 8th Edition.

●Grade Assessment

The score will be evaluated by presentation, report and discussion.

●Notes

●Contacting Faculty

Contact with the faculties at the class room or by email.
Shimizu: shimizu(at)chembio.nagoya-u.ac.jp
Nakatani: nakatanih(at)chembio.nagoya-u.ac.jp
Kiyonaka: kiyonaka(at)chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1A (2.0credits) (応用物理化学セミナー 1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

This seminar aims to be a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined from the following topics, through discussions with faculty members, considering the latest scientific trends and the progress in research of each student.1 Analysis of catalytic reactions by reaction kinetics2 Understanding catalytic reactions by thermodynamics and quantum chemistry3 Basics and applications of spectroscopyFour. Solid surface phenomenaFive. Basics and applications of industrial catalysts6 Resources and energy chemistry7 Topics in catalytic chemistry and material chemistryBefore the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews,and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.(1) Oral presentation at the seminar(2) Contribution to discussionThe acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Chemistry knowledge for undergraduate level is requiredClasses are basically face-to-face or conducted by online.Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion during or after the class or e-mail to the following address.A. Satsuma: satsuma@chembio.nagoya-u.ac.jpK. Sawabe : sawabe@chembio.nagoya-u.ac.jpA. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1A (2.0credits) (応用物理化学セミナー 1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Spring Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in a nanometer scale and then obtain basic skills to design and fabricate efficient energy conversion systems.
Goals and objectives
1. To understand the changes in physicochemical properties of metal and semiconductor materials in a nano-scale region.
2. To design an efficient energy conversion system based on photochemical and electrochemical methods.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to analyze experimental results.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cells
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations. A passing score is 60/100.

●Notes

No special requirement
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1A (2.0credits) (応用物理化学セミナー 1A)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Spring Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 1A (2.0credits) (応用物理化学セミナー 1A)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Spring Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.

Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.
Achievement target2:
You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.
2. By the day of your literature introduction, read a paper related to your master's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.
3. You propose ideas to advance your master's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.
You can select papers should be read and introduced according to your master's thesis research.

●Additional Reading

Instructed during class as needed.

●Grade Assessment

Evaluated the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:
Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1B (2.0credits) (応用物理化学セミナー 1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

This seminar aims to be a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined from the following topics, through discussions with faculty members, considering the latest scientific trends and the progress in research of each student.
1 Analysis of catalytic reactions by reaction kinetics
2 Understanding catalytic reactions by thermodynamics and quantum chemistry
3 Basics and applications of spectroscopy
Four. Solid surface phenomena
Five. Basics and applications of industrial catalysts
6 Resources and energy chemistry
7 Topics in catalytic chemistry and material chemistry
Before the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

Report and oral presentation and discussions.
Grade point follows the rule of University.
Speakers must prepare reports before their presentations.
(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Chemistry knowledge for undergraduate level is required
Classes are basically face-to-face or conducted by online.
Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.

A. Satsuma: satsuma@chembio.nagoya-u.ac.jp
K. Sawabe : sawabe@chembio.nagoya-u.ac.jp
A. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1B (2.0credits) (応用物理化学セミナー 1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Autumn Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in a nanometer scale and then obtain basic skills to design and fabricate efficient energy conversion systems.
Goals and objectives
1. To understand the changes in physicochemical properties of metal and semiconductor materials in a nano-scale region.
2. To design an efficient energy conversion system based on photochemical and electrochemical methods.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to analyze experimental results.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cells
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.
A passing score is 60/100.

●Notes

No special requirement
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1B (2.0credits) (応用物理化学セミナー 1B)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Autumn Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 1B (2.0credits) (応用物理化学セミナー 1B)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Autumn Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.

Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.
Achievement target2:
You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.
2. By the day of your literature introduction, read a paper related to your master's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.
3. You propose ideas to advance your master's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.
You can select papers should be read and introduced according to your master's thesis research.

●Additional Reading

Instruct during class as needed.

●Grade Assessment

Evaluate the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:
Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1C (2.0credits) (応用物理化学セミナー 1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

This seminar aims to be a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined from the following topics, through discussions with faculty members, considering the latest scientific trends and the progress in research of each student.

1 Analysis of catalytic reactions by reaction kinetics
2 Understanding catalytic reactions by thermodynamics and quantum chemistry
3 Basics and applications of spectroscopy
Four. Solid surface phenomena
Five. Basics and applications of industrial catalysts
6 Resources and energy chemistry
7 Topics in catalytic chemistry and material chemistry

Before the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.
(1) Oral presentation at the seminar
(2) Contribution to discussion

The acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.
(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Chemistry knowledge for undergraduate level is required
Classes are basically face-to-face or conducted by online.
Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.
A. Satsuma: satsuma@chembio.nagoya-u.ac.jp
K. Sawabe : sawabe@chembio.nagoya-u.ac.jp
A. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1C (2.0credits) (応用物理化学セミナー 1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Spring Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in a nanometer scale and then obtain basic skills to design and fabricate efficient energy conversion systems.
Goals and objectives
1. To understand the changes in physicochemical properties of metal and semiconductor materials in a nano-scale region.
2. To design an efficient energy conversion system based on photochemical and electrochemical methods.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to analyze experimental results.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cells
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.
A passing score is 60/100.

●Notes

No special requirement
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1C (2.0credits) (応用物理化学セミナー 1C)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Spring Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Report and discussionLiterature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 1C (2.0credits) (応用物理化学セミナー 1C)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Spring Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.Achievement target2: You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.2. By the day of your literature introduction, read a paper related to your master's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.3. You propose ideas to advance your master's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.You can select papers should be read and introduced according to your master's thesis research.

●Additional Reading

Instruct during class as needed.

●Grade Assessment

Evaluate the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1D (2.0credits) (応用物理化学セミナー 1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

This seminar aims to be a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined from the following topics, through discussions with faculty members, considering the latest scientific trends and the progress in research of each student.

1 Analysis of catalytic reactions by reaction kinetics
2 Understanding catalytic reactions by thermodynamics and quantum chemistry
3 Basics and applications of spectroscopy
Four. Solid surface phenomena
Five. Basics and applications of industrial catalysts
6 Resources and energy chemistry
7 Topics in catalytic chemistry and material chemistry

Before the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.
(1) Oral presentation at the seminar
(2) Contribution to discussion

The acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.
(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Chemistry knowledge for undergraduate level is required
Classes are basically face-to-face or conducted by online.
Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.
A. Satsuma: satsuma@chembio.nagoya-u.ac.jp
K. Sawabe : sawabe@chembio.nagoya-u.ac.jp
A. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1D (2.0credits) (応用物理化学セミナー 1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Autumn Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in a nanometer scale and then obtain basic skills to design and fabricate efficient energy conversion systems.
Goals and objectives
1. To understand the changes in physicochemical properties of metal and semiconductor materials in a nano-scale region.
2. To design an efficient energy conversion system based on photochemical and electrochemical methods.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to analyze experimental results.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cells
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.
A passing score is 60/100.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

iscussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 1D (2.0credits) (応用物理化学セミナー 1D)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Autumn Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 1D (2.0credits) (応用物理化学セミナー 1D)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Autumn Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.2. By the day of your literature introduction, read a paper related to your master's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.3. You propose ideas to advance your master's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.You can select papers should be read and introduced according to your master's thesis research.

●Additional Reading

Instruct during class as needed.

●Grade Assessment

Evaluate the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Solid State Chemistry 1A (2.0credits) (固体化学セミナー 1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 1A (2.0credits) (固体化学セミナー 1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop the ability to discover new materials and new functions and to develop basic academic skills to solve the issues logically in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will understand the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, by applying the principle, students will discuss the technology required for the creation of materials in medicine (biomaterials), acquire knowledge and research techniques on the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. General demands on biomaterials
2. Definitions of biomaterials and their properties
3. Definitions of ceramic materials and sintering behavior
4. Synthesis of ceramics
5. Microstructure and properties of ceramics
6. Synthesis of protein by genetic engineering
7. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.
Introduction to Bioceramics, Ed. by L. L. Hench and J. Wilson, World Scientific, Singapore, 1993.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>

S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimoto (k-fuji@chembio.nagoya-u.ac.jp)

Seminar on Solid State Chemistry 1A (2.0credits) (固体化学セミナー 1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Spring Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
To study on the techniques for eco-friendly manufacturing and functional improvement of the novel nano-carbon and inorganic nano materials.

●Prerequisite Subjects
Microscopy, Spectroscopy, Inorganic Chemistry, Resource Chemistry, Environmental Chemistry, Physical Chemistry, Analytical Chemistry, Inorganic Reaction Chemistry

●Course Topics
Literature review of current research is made on the inorganic functional materials such as ceramics with discussion for development of appropriate treatments and process.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
Students should understand important contents of solid-state materials chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more. Grades are as follows: <Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
Spontaneous questions from students are welcome. Discussions on the topics will be open to stimulate students for advanced research with broad view and deep insights.

Seminar on Solid State Chemistry 1A (2.0credits) (固体化学セミナー 1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

The lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained. You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Inorganic Chemistry, Organic Chemistry, Chemistry of Inorganic Synthesis and Inorganic Materials, Physical Chemistry, Solid State Chemistry

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.
A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014

●Additional Reading

Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 1B (2.0credits) (固体化学セミナー 1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 1B (2.0credits) (固体化学セミナー 1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop the ability to discover new materials and new functions and to develop basic academic skills to solve the issues logically in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will understand the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, by applying the principle, students will discuss the technology required for the creation of materials in medicine (biomaterials), acquire knowledge and research techniques on the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. Phase diagram and formation of glass
2. Structure and properties of glass
3. Crystalization of liquid
4. Synthesis of glass-ceramics
5. Surface reaction of glass in body environment
6. Structure, Properties, and functions of biopolymers
7. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.
Introduction to Bioceramics, Ed. by L. L. Hench and J. Wilson, World Scientific, Singapore, 1993.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>

S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimoto (k-fuji@chembio.nagoya-u.ac.jp)

Seminar on Solid State Chemistry 1B (2.0credits) (固体化学セミナー 1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Autumn Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
To study on the techniques for eco-friendly manufacturing and functional improvement of the novel nano-carbon and inorganic nano materials.

●Prerequisite Subjects
Microscopy, Spectroscopy, Inorganic Chemistry, Resource Chemistry, Environmental Chemistry, Physical Chemistry, Analytical Chemistry, Inorganic Reaction Chemistry

●Course Topics
Literature review of current research is made on the functional nano carbon and ceramics materials with discussion for development of appropriate treatments and process.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
Students should understand important contents of solid-state materials chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more. Grades are as follows: <Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
Spontaneous questions from students are welcome. Discussions on the topics will be open to stimulate students for advanced research with broad view and deep insights.

Seminar on Solid State Chemistry 1B (2.0credits) (固体化学セミナー 1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following Solid State Chemistry Seminar 1A, the lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.
You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Seminar on Solid State Chemistry 1A

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.
A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014

●Additional Reading

Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 1C (2.0credits) (固体化学セミナー 1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen
Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka

Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 1C (2.0credits) (固体化学セミナー 1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop the ability to discover new materials and new functions and to develop basic academic skills to solve the issues logically in the challenge of creating new materials that support a sustainable society.
By the end of this seminar, students will understand the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, by applying the principle, students will discuss the technology required for the creation of materials in medicine (biomaterials), acquire knowledge and research techniques on the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. Analysis of reaction between glass and body fluid
2. Design of bioactive materials
3. Biomimetic processing
4. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.
Introduction to Bioceramics, Ed. by L. L. Hench and J. Wilson, World Scientific, Singapore, 1993.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimoto (k-fuji@chembio.nagoya-u.ac.jp)

Seminar on Solid State Chemistry 1C (2.0credits) (固体化学セミナー 1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Spring Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
To study on the techniques for eco-friendly manufacturing and functional improvement of the novel nano-carbon and inorganic nano materials.

●Prerequisite Subjects
Microscopy, Spectroscopy, Inorganic Chemistry, Resource Chemistry, Environmental Chemistry, Physical Chemistry, Analytical Chemistry, Inorganic Reaction Chemistry

●Course Topics
Literature review of current research is made on the functional nano carbon and ceramics materials with discussion for development of appropriate treatments and process.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
Students should understand important contents of solid-state materials chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more. Grades are as follows: <Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
Spontaneous questions from students are welcome. Discussions on the topics will be open to stimulate students for advanced research with broad view and deep insights.

Seminar on Solid State Chemistry 1C (2.0credits) (固体化学セミナー 1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following Solid State Chemistry Seminar 1A, the lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.
You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Seminar on Solid State Chemistry 1A, 1B

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials
3. Applications of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.
A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014

●Additional Reading

Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 1D (2.0credits) (固体化学セミナー 1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 1D (2.0credits) (固体化学セミナー 1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop the ability to discover new materials and new functions and to develop basic academic skills to solve the issues logically in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will understand the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, by applying the principle, students will discuss the technology required for the creation of materials in medicine (biomaterials), acquire knowledge and research techniques on the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. Organic-inorganic hybrids
2. Hyperthermia with ceramic materials
3. Biomaterials for tissue regeneration
4. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.
Introduction to Bioceramics, Ed. by L. L. Hench and J. Wilson, World Scientific, Singapore, 1993.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 1D (2.0credits) (固体化学セミナー 1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Autumn Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
To study on the techniques for eco-friendly manufacturing and functional improvement of the novel nano-carbon and inorganic nano materials.

●Prerequisite Subjects
Microscopy, Spectroscopy, Inorganic Chemistry, Resource Chemistry, Environmental Chemistry, Physical Chemistry, Analytical Chemistry, Inorganic Reaction Chemistry

●Course Topics
Literature review of current research is made on the functional nano carbon and ceramics materials with discussion for development of appropriate treatments and process.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
Students should understand important contents of solid-state materials chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more. Grades are as follows: <Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
Spontaneous questions from students are welcome. Discussions on the topics will be open to stimulate students for advanced research with broad view and deep insights.

Seminar on Solid State Chemistry 1D (2.0credits) (固体化学セミナー 1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following Solid State Chemistry Seminar 1C, the lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.
You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Seminar on Solid State Chemistry 1A, 1B, 1C

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials
3. Applications of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.
A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014

●Additional Reading

Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

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.

Advanced Catalyst Design (2.0credits) (触媒設計学特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Chemistry	
Starts 1	Spring Semester ,every other year	
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer

●Course Purpose

In this lecture, we learn the principles and applications of solid catalysts utilizing surface chemical functions. By understanding catalysts and solid surfaces that promote chemical reactions in atomic and molecular levels, we will develop the ability to create innovative materials and design chemical processes that support a sustainable society. It is necessary to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc. In this lecture, the goal is to have the following knowledge and skills at the end of the lecture.
1. Understand the principles of catalysis through learning examples of heterogeneous catalysis, adsorption phenomena, catalysis rates, and catalyst structure-activity relationships.
2. Understand the design guidelines and structural analysis of solid catalysts and apply them to your own research.
3 Understand and apply theory describing the rate of elementary reactions and theory describing the mechanism and rate of complex reactions.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

1. General introduction, adsorption
2. Solid acids and bases, oxidation catalysts, metal catalysts, metal oxide catalysts, environmental catalysts
3. Characterizations for solids and surfaces
4, Crystallography of solid surface
5. Theoretical calculation for material design

Please read the documents for the next week in advance. We will check the preparation by quizzes in every week.

●Textbook

Documents will be provided.

●Additional Reading

R.A. van Santen, Modern Heterogeneous Catalysis, Wiley-VCH, Weinheim(2017).

●Grade Assessment

Credits will be awarded to those students who score 60 or more based on the evaluation of academic achievements. The academic achievement is evaluated by examination, report, quiz or by their combination. A correct understanding of the concepts and terms related to heterogeneous catalysis and surface chemistry is the criterion for passing.

●Notes

[Conditions and precautions]
Chemistry knowledge for undergraduate level is required
Both face-to-face class and remote (online, Teams) are available.
Materials will be distributed from "Resources" of NUCT.
For the response to questions, see below.

●Contacting Faculty

[Responding to questions]
If you have any questions, do not hesitate
to ask (1) directly in the classroom, (2) unmute online and speak,
or mail to
A. Satsuma: satsuma@chembio.nagoya-u.ac.jp
K. Sawabe : sawabe@chembio.nagoya-u.ac.jp

Advanced Materal Design Chemistry (2.0credits) (材料設計化学特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Chemistry	
Starts 1	Autumn Semester ,every other year	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

More precise designing of advanced catalysts and semiconductor devices requires more precise control of surface atoms and molecules in the nanoscale. The aim of this lecture is to learn the basic concept of electrochemical and photochemical science from the viewpoint of designing surface structures in the nanoscale and to discuss about the future prospects on catalysts, semiconductor devices, and sensors.

●Prerequisite Subjects

Physical Chemistry, Inorganic Chemistry. Those who did not graduate from a chemistry department are recommended to take course 'Fundamentals of Physical Chemistry' (Lecture code: 6323) in advance.

●Course Topics

The following 5 items of the lecture contents will be treated:
1. History of the development of nanomaterials,
2. Catalytic and electrochemical reactions,
3. Luminescent materials,
4. Light-energy conversion systems,
5. Designing and analyzing nano-structured functional materials.
6. Future of expected-nanotechnology

Submit questions about the content of the lesson after each lecture.
Also, you will be required to submit several report assignments.

●Textbook

Lecture materials are downloaded and distributed in PDF format from NUCT. Please bring them as printed or electronic data before each lecture. You can also view electronic data using a tablet or PC during the lecture.

●Additional Reading

"Basic Electrochemistry" (Kagaku Dojin), Toshiyuki Oosakai, Kenji Kano, Susumu Kuwabata

●Grade Assessment

Grades will be based on class attendance rate, presentation in classes, and the homework. Getting more than 60% points will be required to get a credit of the lecture.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by NUCT message.

●Contacting Faculty

Office hours: Monday to Friday, 9:00 to 17:00, and by appointment.

Advanced Energy Conversion Chemistry (2.0credits) (エネルギー環境化学特論)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Chemistry
Starts 1	Autumn Semester ,every other year
Lecturer	Koichi KIKUTA Professor Jun KUMAGAI Associate Professor

●Course Purpose

This lecture is composed of basis and applications for energy and environmental chemistry.For energy chemistry, some applications of energy conversion materials and energy conversion devices such as solid oxide fuel cell are introduced.For environmental chemistry, radiation chemistry, radiation biology and therapy, ionizing radiation for industrial applications, cosmic-ray related with climate change are introduced on the basis of physical interactions between ionizing radiation and matters.

●Prerequisite Subjects

Basic lectures for inorganic, physical, and analytical chemistry

●Course Topics

Current condition of energy consumption Energy conversion materials and devices Topics on energy, environment, and resources Discover history of ionizing radiationInteractions between ionizing radiations and mattersRadiation chemistryRadiations in univers, solar systems, and earth.Radiation biology including therapy. Ionizing radiation for industrial applications.In this course, assignments will be given as needed.

●Textbook

Reference books are as follows. Documents based on the reference books are handed out to the students.

●Additional Reading

"Basis for the safe treatment of ionizing radiation" edited by K NIshizawa and T. Iida, Nagoya Univ. publication company.

●Grade Assessment

Goal attainment level is evaluated by exercises and reports.Credits will be given if students fully understand the contents of the class.

●Notes

No registration requirements

●Contacting Faculty

Students may ask or discuss with professors at lecture's room after the lecture. Make appointment by email or phone when you want to contact with professors at out of lecture.Prof. Koichi Kikuta (ext. 3345; kik@chembio.nagoya-u.ac.jpAssociate Prof. Jun Kumagai (ext. 2591; kumagai@imass.nagoya-u.ac.jp

Advanced Lecture on Inorganic Materials Chemistry (2.0credits) (無機材料化学特論)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Materials Chemistry		
Starts 1	Autumn Semester ,every other year		
Lecturer	Ryoutarou MATSUDA Professor	Chikara OHTUKI Professor	SEN Susan Designated Associate Professor
	Hiroaki IGUCHI Associate Professor		

●Course Purpose

The aim of this lecture is to deepen the understanding of the synthesis, structure, and physical properties of various materials, mainly inorganic and coordination compounds, and to achieve the application skills for developing functions, such as molecular adsorption using nanospace and improvement of various properties by ceramic microstructure design.
By learning this lecture, the goal is to be able to:
1. Explain the typical synthetic methods of inorganic and coordination compounds.
2. Understand the fundamentals of crystallography and explain the crystal structure of inorganic and coordination compounds.3.Explain the typical functions of inorganic and coordination compounds.
4. Explain the functions and applications of nanospace materials.
5. Explain the relationship between the ceramic synthesis method and the microstructure.
6. Explain the relationship between the microstructure of ceramics and the expression of function.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Inorganic Chemistry 3, Inorganic Chemistry 4

●Course Topics

1. Synthesis, structures and functions of inorganic and coordination compounds.
2. Functions and applications of nanospace materials.
3. Microstructure and function of ceramics.

Read the previous lecture materials and designated part of the textbook before each class. After class, read and review textbooks and lecture materials. In addition, if a report is requested, write and submit it.

●Textbook

Specify as appropriate as the lecture progresses

●Additional Reading

Introduce as appropriate as the lecture progresses.

●Grade Assessment

Students should achieve the goal of this course. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more.

Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No requirements.
The lecture will be given as the hybrid-type (at online and/or lecture room), however, it may change

according to the situation.
The tool for online lecture: Zoom or on-demand video streaming.

●Contacting Faculty

Questions after the lecture will be accepted and answered in the lecture room.
Questions at other times will be accepted and answered by email.

Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Professor Chikara Ohtsuki
:3343 / E-mail:ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki
:3602 / E-mail:ayae@energy.nagoya-u.ac.jp)
Designated Associate Professor Susan Sen
Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Associate Professor Hiroaki Iguchi
Tel:5114/ Email: hiroaki.iguchi@chembio.nagoya-u.ac.jp

Advanced Functional Materials Chemistry (2.0credits) (機能材料化学特論)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Materials Chemistry		
Starts 1	Autumn Semester ,every other year		
Lecturer	Ryoutarou MATSUDA Professor	Chikara OHTUKI Professor	SEN Susan Designated Associate Professor
	Hiroaki IGUCHI Associate Professor		

●Course Purpose

The purpose of this course is to understand basic concept of functional materials including inorganic solid materials (ceramics and crystalline porous materials) and organic-inorganic hybrid materials in order to acquire the ability to create new materials and their applications that support a sustainable society. By taking up medical materials and molecular adsorption materials as specific functional materials, the ability to apply them to practical materials are developed.

Goal of this course
1. to acquire fundamental knowledge of design concept and synthesis of biomedical materials
2. to understand the content of research papers on state-of-the-art biomedical materials
3. to develop the ability to evaluate the significance and value of medical materials and future prospects
4. to acquire fundamental knowledge of crystallography
5. to understand the structures and functions of crystalline porous materials

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Lectures on the following contents will be given.

1. Ceramics and biomaterials.
2. Ceramics for artificial joints
3. Design of bioactive materials
4. Bioactive organic-inorganic hybrids for bone repairing
5. Development of functional materials through biomimetic processing
6. Fundamental study of crystallography
7. Structures and functions of crystalline porous materials
8. Summary and evaluation

Examinations or reports will be assigned after the classes.
References such as scientific papers will be provided in the classes for further reading.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. By T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.
Introduction to Bioceramics, Ed. by L. L. Hench and J. Wilson, World Scientific, Singapore, 1993.

Inorganic Functional Materials, Ed. by K. Koumoto, Tokyo Kagaudojin (2009)(in Japanese)
Ceramic Biomaterials, Ed. by Okazaki et al., Corona Publishing, 2009. (in Japanese)
Biomaterials, Ed. by J. Tanaka et al., Uchida Rokakuho Publishing, 2008. (in Japanese)

Other references will be introduced during the class as necessary.

●Grade Assessment

Students should achieve the goal of this course. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more.

Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No requirements.
The lecture will be given as the hybrid-type (at online and/or lecture room), however, it may change according to the situation.
The tool for online lecture: Zoom or on-demand video streaming.

●Contacting Faculty

Questions after the lecture will be accepted and answered in the lecture room.
Questions at other times will be accepted and answered by email.

Professor Chikara Ohtsuki
Tel:3343 / E-mail:ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki
Tel:3602 / E-mail:ayae@energy.nagoya-u.ac.jp)
Professor Ryotaro Matsuda
Tel:4603 / Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen
Tel:5114 / Email: sen.susan@chembio.nagoya-u.ac.jp

Advanced Porous Materials Chemistry (2.0credits) (多孔材料化学特論)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Materials Chemistry		
Starts 1	Spring Semester ,every other year		
Lecturer	NAKANISHI Kazuki Professor	OSADA Minoru Professor	Joji HASEGAWA Designated Associate Professor
	KOBAYASHI Makoto Associate Professor		

●Course Purpose

This lecture deals with the synthesis, characterization and applications of functional ceramics related to porous materials and nanomaterials in energy and environmental fields. In addition to the ceramic materials based on amorphous or polycrystalline inorganics, organic-inorganic hybrid materials will be included in the topics.

●Prerequisite Subjects

Inorganic Chemistry, Analytical Chemistry, Physical Chemistry, Inorganic Materials Chemistry, Chemistry of Catalyst and Catalysis, Environmental Chemistry, Materials Science

●Course Topics

1) Structure and properties of ceramic materials (mainly on inorganic glasses)2) Preparation of ceramic materials via liquid-phase route3) Structure control of ceramic materials via liquid-phase route4) Functionalization and application of ceramic materials via liquid-phase route5) Preparation of organic-inorganic hybrid materials6) Characterization technique of porous ceramic materialsExaminations or reports will be assigned after the classes.References such as scientific papers will be provided in the classes for further reading.

●Textbook

Textbooks are not designated. Prints and digital literature files are distributed when necessary.

●Additional Reading

A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment

Students should understand important contents of solid-state materials chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more. Grades are as follows: <Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

None specified. In 2022, the hybrid-type lecture will be given.

●Contacting Faculty

Answered mainly during the lecture. Emails should be addressed to Prof. Nakanishi.

Advanced Functional Materials Engineering (2.0credits) (機能物質工学特論)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Lecture		
Course Name	Materials Chemistry		
Starts 1	Spring Semester ,every other year		
Lecturer	OSADA Minoru Professor	NAKANISHI Kazuki Professor	KOBAYASHI Makoto Associate Professor
	Joji HASEGAWA Designated Associate Professor		

●Course Purpose

The objective of this course is to study the synthesis, processing, properties and applications of nanomaterials, to develop a basic understanding the "state-of-the-art" in nanomaterials science and nanotechnology. The lecture also deals with the synthesis, characterization and applications of functional ceramics related to porous materials and hierarchically structured materials in energy and environmental fields. In addition to the ceramic materials based on amorphous or polycrystalline inorganics, organic-inorganic hybrid materials will be included in the topics. From the lecture, fundamental concept on nanomaterial and functional material researches will be learned.

●Prerequisite Subjects

Fundamental Chemistry I, Fundamental Chemistry II, Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction (Inorganic Chemistry 3), and Inorganic Material Chemistry (Inorganic Chemistry 4), Analytical Chemistry 1 with Exercises, Analytical Chemistry 2 with Exercises, Analytical Chemistry 3, Physical Chemistry 1 with Exercises (Chemical Kinetics with Exercises), Physical Chemistry 2 with Exercises (Thermodynamics 1 with Exercises), Physical Chemistry 3 with Exercises (Quantum Chemistry 1 with Exercises), Physical Chemistry 4 with Exercises (Thermodynamics 2 with Exercises), Physical Chemistry 5 with Exercises (Quantum Chemistry 2 with Exercises), Physical Chemistry 6 (Energy and Theoretical Chemistry)

●Course Topics

1) Nanotechnology
2) Nanomaterials
3) 1D nanomaterials
4) 2D nanomaterials
5) Nano-materials design & characterization
6) Nano-processing technology, Nano-fabrication
7) Electronic applications of nanomaterials
8) Energy & environmental applications of nanomaterials
9) Structure and properties of ceramic materials (mainly on inorganic glasses)
10) Preparation of ceramic materials via liquid-phase route
11) Structure control of ceramic materials via liquid-phase route
12) Functionalization and application of ceramic materials via liquid-phase route
13) Preparation of organic-inorganic hybrid materials
14) Characterization technique of porous ceramic materials

On each lecture, reference information such as scientific paper will be given.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

A. R. West: Solid State Chemistry, WILEY
William D. Callister Jr.: Materials Science and Engineering, Wiley

When necessary, other textbooks will be introduced.

●Grade Assessment

Concepts and principle of nanotechnology and nanomaterial researches should be understood properly. Reports and examination credits will be awarded to those students who score 60 or more. Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

In 2022, the on-site lecture will be given.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the class. Otherwise, contact the professors by e-mail in advance.

Prof. Minoru Osada (mosada[at]imass.nagoya-u.ac.jp)
Prof. Kazuki Nakanishi (dknakanishi[at]imass.nagoya-u.ac.jp)
Assoc. Prof. George Hasegawa (h-george[at]imass.nagoya-u.ac.jp)
Assoc. Prof. Makoto Kobayashi (mkoba[at]imass.nagoya-u.ac.jp)

Selected Topics on Applied Physical Chemistry Ⅰ (1.0credits) (応用物理化学特別講義 Ⅰ)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Chemistry
Starts 1	Spring Semester ,every other year
Lecturer	Part-time Faculty

●Course Purpose

The objective of this lecture is that we become a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. We study advanced topics related to physical chemistry from the front-line researchers in the fields of catalysis, surface chemistry, photochemistry, electrochemistry, nanomaterials, environmental chemistry, computational chemistry, and so on. The aim of this lecture is to expand our knowledge, creativity and applied skins in physical chemistry, to become integrated professionals.

●Prerequisite Subjects

Fundamental Chemistry I, Fundamental Chemistry II, Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction (Inorganic Chemistry 3), and Inorganic Material Chemistry (Inorganic Chemistry 4), Analytical Chemistry 1 with Exercises, Analytical Chemistry 2 with Exercises, Analytical Chemistry 3, Physical Chemistry 1 with Exercises (Chemical Kinetics with Exercises), Physical Chemistry 2 with Exercises (Thermodynamics 1 with Exercises), Physical Chemistry 3 with Exercises (Quantum Chemistry 1 with Exercises), Physical Chemistry 4 with Exercises (Thermodynamics 2 with Exercises), Physical Chemistry 5 with Exercises (Quantum Chemistry 2 with Exercises), Physical Chemistry 6 (Energy and Theoretical Chemistry), Physical Chemistry of Macromolecules

●Course Topics

We learn advanced topics related to physical chemistry, such as catalysis, surface chemistry, photochemistry, electrochemistry, nanomaterials, environmental chemistry, computational chemistry, and so on. The contents of the lecture are;1. Review of physical chemistry for undergraduate students2. General research trends in the field3. Background of cutting edge fields4. Research trend in cutting edge fields5. Q & A session, discussion.

●Textbook

Basically, textbooks are not prescribed. In case of necessity, printed handouts will be distributed in each lecture.

●Additional Reading

In case of necessity, printed handouts, papers and references will be distributed in each lecture.

●Grade Assessment

Required-work consists of homework assignments, etc., presented by each teacher and attendance rate. Credits will be awarded to those students who score 60 or more.<Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No registration requirements

●Contacting Faculty

Do not hesitate to ask any questions during the class.

Selected Topics on Applied Physical Chemistry II (1.0credits) (応用物理化学特別講義 II)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Chemistry
Starts 1	Spring Semester ,every other year
Lecturer	Part-time Faculty

●Course Purpose

The objective of this lecture is that we become a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. We study advanced topics related to physical chemistry from the front-line researchers in the fields of catalysis, surface chemistry, photochemistry, electrochemistry, nanomaterials, environmental chemistry, computational chemistry, and so on. The aim of this lecture is to expand our knowledge, creativity and applied skins in physical chemistry, to become integrated professionals.

●Prerequisite Subjects

Fundamental Chemistry I, Fundamental Chemistry II, Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction (Inorganic Chemistry 3), and Inorganic Material Chemistry (Inorganic Chemistry 4), Analytical Chemistry 1 with Exercises, Analytical Chemistry 2 with Exercises, Analytical Chemistry 3, Physical Chemistry 1 with Exercises (Chemical Kinetics with Exercises), Physical Chemistry 2 with Exercises (Thermodynamics 1 with Exercises), Physical Chemistry 3 with Exercises (Quantum Chemistry 1 with Exercises), Physical Chemistry 4 with Exercises (Thermodynamics 2 with Exercises), Physical Chemistry 5 with Exercises (Quantum Chemistry 2 with Exercises), Physical Chemistry 6 (Energy and Theoretical Chemistry), Physical Chemistry of Macromolecules

●Course Topics

We learn advanced topics related to physical chemistry, such as catalysis, surface chemistry, photochemistry, electrochemistry, nanomaterials, environmental chemistry, computational chemistry, and so on. The contents of the lecture are;1. Review of physical chemistry for undergraduate students2. General research trends in the field3. Background of cutting edge fields4. Research trend in cutting edge fields5. Q & A session, discussion.

●Textbook

Basically, textbooks are not prescribed. In case of necessity, printed handouts will be distributed in each lecture.

●Additional Reading

In case of necessity, printed handouts, papers and references will be distributed in each lecture.

●Grade Assessment

Required-work consists of homework assignments, etc., presented by each teacher and attendance rate. Credits will be awarded to those students who score 60 or more.<Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No registration requirements

●Contacting Faculty

Do not hesitate to ask any questions during the class.

Selected Topics on Solid State Chemistry I (1.0credits) (固体化学特別講義 I)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Chemistry
Starts 1	Spring Semester ,every other year
Lecturer	Part-time Faculty

●Course Purpose

The objective of this lecture is that we become a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. We study advanced topics related to solid-state chemistry from the front line researchers in the fields of organic-inorganic hybrid materials, ceramics, biocompatible materials, nanocarbon materials, chemical reactions at ultra-low temperature and so on. The aim of this lecture is to expand our knowledge, creativity and applied skins in solid-state chemistry, to become integrated professionals.

●Prerequisite Subjects

Fundamental Chemistry I, Fundamental Chemistry II, Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction (Inorganic Chemistry 3), and Inorganic Material Chemistry (Inorganic Chemistry 4), Analytical Chemistry 1 with Exercises, Analytical Chemistry 2 with Exercises, Analytical Chemistry 3, Physical Chemistry 1 with Exercises (Chemical Kinetics with Exercises), Physical Chemistry 2 with Exercises (Thermodynamics 1 with Exercises), Physical Chemistry 3 with Exercises (Quantum Chemistry 1 with Exercises), Physical Chemistry 4 with Exercises (Thermodynamics 2 with Exercises), Physical Chemistry 5 with Exercises (Quantum Chemistry 2 with Exercises), Physical Chemistry 6 (Energy and Theoretical Chemistry)

●Course Topics

We learn advanced topics related to solid-state chemistry, such as organic-inorganic hybrid materials, ceramics, biocompatible materials, nanocarbon materials, chemical reactions at ultra-low temperature, and so on. The contents of the lecture are; 1. Review of solid-state chemistry for undergraduate students2. General research trends in the field3. Background of cutting edge fields4. Research trend in cutting edge fields5. Q & A session, discussion.

●Textbook

Basically, textbooks are not prescribed. In case of necessity, printed handouts will be distributed in each lecture.

●Additional Reading

In case of necessity, printed handouts, papers and references will be distributed in each lecture.

●Grade Assessment

Required-work consists of homework assignments, etc., presented by each teacher and attendance rate. Credits will be awarded to those students who score 60 or more.<Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No registration requirements

●Contacting Faculty

Do not hesitate to ask any questions during the class.

Selected Topics on Solid State Chemistry II (1.0credits) (固体化学特別講義 II)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Chemistry
Starts 1	Spring Semester ,every other year
Lecturer	Part-time Faculty

●Course Purpose

The objective of this lecture is that we become a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. We study advanced topics related to solid-state chemistry from the front line researchers in the fields of organic-inorganic hybrid materials, ceramics, biocompatible materials, nanocarbon materials, chemical reactions at ultra-low temperature and so on. The aim of this lecture is to expand our knowledge, creativity and applied skins in solid-state chemistry, to become integrated professionals.

●Prerequisite Subjects

Fundamental Chemistry I, Fundamental Chemistry II, Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction (Inorganic Chemistry 3), and Inorganic Material Chemistry (Inorganic Chemistry 4), Analytical Chemistry 1 with Exercises, Analytical Chemistry 2 with Exercises, Analytical Chemistry 3, Physical Chemistry 1 with Exercises (Chemical Kinetics with Exercises), Physical Chemistry 2 with Exercises (Thermodynamics 1 with Exercises), Physical Chemistry 3 with Exercises (Quantum Chemistry 1 with Exercises), Physical Chemistry 4 with Exercises (Thermodynamics 2 with Exercises), Physical Chemistry 5 with Exercises (Quantum Chemistry 2 with Exercises), Physical Chemistry 6 (Energy and Theoretical Chemistry)

●Course Topics

We learn advanced topics related to solid-state chemistry, such as organic-inorganic hybrid materials, ceramics, biocompatible materials, nanocarbon materials, chemical reactions at ultra-low temperature, and so on. The contents of the lecture are;1. Review of solid-state chemistry for undergraduate students2. General research trends in the field3. Background of cutting edge fields4. Research trend in cutting edge fields5. Q & A session, discussion.

●Textbook

Basically, textbooks are not prescribed. In case of necessity, printed handouts will be distributed in each lecture.

●Additional Reading

In case of necessity, printed handouts, papers and references will be distributed in each lecture.

●Grade Assessment

Required-work consists of homework assignments, etc., presented by each teacher and attendance rate. Credits will be awarded to those students who score 60 or more.<Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No registration requirements

●Contacting Faculty

Do not hesitate to ask any questions during the class.

Advanced Experiments and Exercises in Applied Physical Chemistry I (4.0credits) (応用物理化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 Chemistry		
Starts 1	1 Spring and Autumn Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

This seminar aims to be a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. In the lectures, we will improve our research skills based on basic studies. Exercise of the following research fields: solid catalysis, solid surface, reaction mechanism, kinetics, characterization of solids, quantum chemistry, spectroscopy, physical chemistry, inorganic chemistry, organic chemistry, and related area.We understand the principles of catalysis on solid surfaces (basic skills), design novel catalysts and catalytic systems (applied skills), and integrate them as developing researchers.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

The topics will be determined from the following topics, through discussions with faculty members, considering the latest scientific trends and the progress in research of each student.
1. Structure and function of solids
2. Characterizations of solid catalysts
3. Mechanism of catalytic reactions and surface phenomenon
4. Environmental catalysts and natural resources
5. Surface design of organic solids

Reports summarized your topic must be submitted by the lecture day. The score is evaluated through explanations, questions, and discussions in the lecture.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.
(1) Oral presentation at the seminar
(2) Contribution to discussion

The acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.
(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Chemistry knowledge for undergraduate level is required.
Classes are basically face-to-face or conducted by online.
Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.
A. Satsuma: satsuma@chembio.nagoya-u.ac.jp
K. Sawabe : sawabe@chembio.nagoya-u.ac.jp

dvanced Experiments and Exercises in Applied Physical Chemistry I (4.0credits) (応用物理化学特別実験及び演習

A. Oda : akira@chembio.nagoya-u.ac.jp

Advanced Experiments and Exercises in Applied Physical Chemistry I (4.0credits) (応用物理化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 Chemistry	
Starts 1	1 Spring and Autumn Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this course, we will understand the phenomena at the interfaces in atomic and molecular scales and then design and fabricate effective photochemical or electrochemical systems.
Goals and objectives
1. To prepare materials having the sizes in a nanometer scale and then clarify their size-dependent physicochemical properties.
2. To fabricate energy conversion systems by the combination of various functional materials and to evaluate their efficiency.
We will learn the basic methods of photochemical and electrochemical preparation for energy conversion systems, and then obtain the abilities to analyze the experimental results qualitatively and quantitatively.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Characterization with electrochemical methods
2. Fabrication of solar cell
3. Preparation of photocatalyts
4. Designing functional materials through controlling nanostructures
5. Evaluation of photochemical and electrochemical properties
Please read the designated literature before starting each experiment.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations and reports.A passing score is 60/100.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during the course, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Advanced Experiments and Exercises in Applied Physical Chemistry I (4.0credits) (応用物理化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 Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The aim of this course is to help students acquire an understanding of the fundamental principles of inorganic materials chemistry through the development of functional devices.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

No registration requirements

●Contacting Faculty

Advanced Experiments and Exercises in Applied Physical Chemistry I (4.0credits) (応用物理化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 Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

In this special experiment and Exercise I, you will learn in detail the measurement principle of electron spin resonance equipment necessary for research in radiation chemistry, radiation biology, and photocatalytic chemistry. You will be able to prepare samples under the correct conditions and to analyze the obtained spectra correctly.

Achievement target 1: You will be able to propose analysis methods according to experimental samples.
Achievement 2: You will be able to measure the samples with the right conditions and analyze the spectra correctly.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. ESR measurement of organic radical and its spectrum analysis are performed.
2. ESR measurement of inorganic material and its spectrum analysis are performed.
3. ESR measurement and spectral analysis of cell-related samples are performed.

●Textbook

”Introduction to Electronic Spin Science & Technology”, Supervised by the Society of Electron Spin Science and Technology, Yoneda Publishing.

●Additional Reading

Weil Bolton, "Electron Paramagnetic Resonance"

●Grade Assessment

You will be evaluated by both the experiment and analysis. On the experiments, it is important that whether the ESR measurement sample is properly adjusted and measured under the correct conditions (tuning of resonance state, microwave intensity, field modulation width, time constant, magnetic field sweep range) or not. On the analysis, it is important that whether you can simulate the experimental spectra with appropriate ESR parameters of g value, hyperfine coupling constants or not. Grading will be decided based on experimental performance (50%) and spectra simulation results (50%).

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:
Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

vanced Experiments and Exercises in Applied Physical Chemistry II (4.0credits) (応用物理化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 Chemistry		
Starts 1	2 Spring and Autumn Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

This seminar aims to be a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. In the lectures, we will improve our research skills based on basic studies. Exercise of the following research fields: solid catalysis, solid surface, reaction mechanism, kinetics, characterization of solids, quantum chemistry, spectroscopy, physical chemistry, inorganic chemistry, organic chemistry, and related area.We understand the principles of catalysis on solid surfaces (basic skills), design novel catalysts and catalytic systems (applied skills), and integrate them as developing researchers.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

The topics will be determined from the following topics, through discussions with faculty members, considering the latest scientific trends and the progress in research of each student.
1. Structure and function of solids
2. Characterizations of solid catalysts
3. Mechanism of catalytic reactions and surface phenomenon
4. Environmental catalysts and natural resources
5. Surface design of organic solids

Reports summarized your topic must be submitted by the lecture day. The score is evaluated through explanations, questions, and discussions in the lecture.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.
(1) Oral presentation at the seminar
(2) Contribution to discussion

The acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.
(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Chemistry knowledge for undergraduate level is required.
Classes are basically face-to-face or conducted by online.
Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.
A. Satsuma: satsuma@chembio.nagoya-u.ac.jp
K. Sawabe : sawabe@chembio.nagoya-u.ac.jp

vanced Experiments and Exercises in Applied Physical Chemistry II (4.0credits) (応用物理化学特別実験及び演習

A. Oda : akira@chembio.nagoya-u.ac.jp

vanced Experiments and Exercises in Applied Physical Chemistry II (4.0credits) (応用物理化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 Chemistry	
Starts 1	2 Spring and Autumn Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this course, we will understand the phenomena at the interfaces in atomic and molecular scales and then design and fabricate effective photochemical or electrochemical systems.
Goals and objectives
1. To prepare materials having the sizes in a nanometer scale and then clarify their size-dependent physicochemical properties.
2. To fabricate energy conversion systems by the combination of various functional materials and to evaluate their efficiency.
We will learn the basic methods of photochemical and electrochemical preparation for energy conversion systems, and then obtain the abilities to analyze the experimental results qualitatively and quantitatively.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Characterization with electrochemical methods
2. Fabrication of solar cell
3. Preparation of photocatalyts
4. Designing functional materials through controlling nanostructures
5. Evaluation of photochemical and electrochemical properties
Please read the designated literature before starting each experiment.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations and reports.A passing score is 60/100.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during the course, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

vanced Experiments and Exercises in Applied Physical Chemistry II (4.0credits) (応用物理化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 Chemistry
Starts 1	2 Spring and Autumn Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The aim of this course is to help students acquire an understanding of the fundamental principles of inorganic materials chemistry through the development of functional devices.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

vanced Experiments and Exercises in Applied Physical Chemistry II (4.0credits) (応用物理化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 Chemistry
Starts 1	2 Spring and Autumn Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

In this special experiment and Exercise I, you will learn in detail the measurement principle of electron spin resonance equipment necessary for research in radiation chemistry, radiation biology, and photocatalytic chemistry. You will be able to prepare samples under the correct conditions and to analyze the obtained spectra correctly.Achievement target 1: You will be able to propose analysis methods according to experimental samples.Achievement 2: You will be able to measure the samples with the right conditions and analyze the spectra correctly.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. ESR measurement of organic radical and its spectrum analysis are performed.2. ESR measurement of inorganic material and its spectrum analysis are performed.3. ESR measurement and spectral analysis of cell-related samples are performed.

●Textbook

”Introduction to Electronic Spin Science & Technology”, Supervised by the Society of Electron Spin Science and Technology, Yoneda Publishing.

●Additional Reading

Weil Bolton, "Electron Paramagnetic Resonance"

●Grade Assessment

You will be evaluated by both the experiment and analysis. On the experiments, it is important that whether the ESR measurement sample is properly adjusted and measured under the correct conditions (tuning of resonance state, microwave intensity, field modulation width, time constant, magnetic field sweep range) or not. On the analysis, it is important that whether you can simulate the experimental spectra with appropriate ESR parameters of g value, hyperfine coupling constants or not. Grading will be decided based on experimental performance (50%) and spectra simulation results (50%).

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Advanced Experiments and Exercises in Solid State Chemistry I (4.0credits) (固体化学特別実験及び演習　I)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Chemistry		
Starts 1	1 Spring and Autumn Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this experiment and practice is to deepen understanding of physical properties of nano-space materials such as crystal structure and gas adsorption, and conduct research based on original ideas and to acquire the ability of research skills by conducting synthesis, X-ray diffraction measurement and physical property measurement of nano-space materials.

Through these experiments and exercises, students will be able to acquire techniques for synthesizing, analyzing structures and measuring physical properties of nano-space materials based on metal complexes. In addition, it will be possible to conduct research on the development of nano-space materials with original ideas.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Matrials

●Course Topics

Synthesis experiments of nanoporous metal complexes
Crystal structural analysis of nanoporous metal complexes
Properties measurements of nanoporous metal complexes
Gas adsorption measurements
Research presentations for results and discussion

Study and understand the relevant literature before experiments and exercises. After the experiments and exercises, organize and analyze the data and give sufficient consideration.

●Textbook

Specify as appropriate as the progresses of this course.

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the progresses of this course.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Advanced Experiments and Exercises in Solid State Chemistry I (4.0credits) (固体化学特別実験及び演習　I)

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen
Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Advanced Experiments and Exercises in Solid State Chemistry I (4.0credits) (固体化学特別実験及び演習　I)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Chemistry		
Starts 1	1 Spring and Autumn Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this experiment and exercise is to develop the ability to discover new materials and new functions and to develop basic academic skills to solve the issues logically in the challenge of creating new materials that support a sustainable society.

By the end of this course, students will understand the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, students will be able to deepen their understanding of the technologies required for the creation of ceramic/organic polymer materials in medicine (biomaterials) through experimental training and acquire research techniques on the synthesis and analysis of biomaterials.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Students will work on the following experiments and exercises.

1. Synthesis of ceramic materials
2. Synthesis of glass
3. Analysis of microstructure
4. Characterization and properties
5. Synthesis of proteins
6. Structural analysis of proteins
7. Summary and evaluation

Students should make a plan for the safe experiments.
Students should review research papers that are provided in the course.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.

Other references will be introduced during the class as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude and reports.
Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>

S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the course.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Advanced Experiments and Exercises in Solid State Chemistry I (4.0credits) (固体化学特別実験及び演習　I)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Chemistry	
Starts 1	1 Spring and Autumn Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose

To study on the techniques for eco-friendly manufacturing and functional improvement of the novel inorganic nanomaterials.

●Prerequisite Subjects

Microscopy, Spectroscopy, Inorganic Chemistry, Resource Chemistry, Environmental Chemistry, Physical Chemistry, Analytical Chemistry, Inorganic Reaction Chemistry

●Course Topics

Literature review of current research is made on the functional nano carbon and ceramics materials with discussion for development of appropriate treatments and process.References such as scientific papers will be provided in the classes for further reading.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment

Students should understand important contents of solid-state materials chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more. Grades are as follows: <Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No specific requirements.

●Contacting Faculty

Spontaneous questions from students are welcome. Discussions on the topics will be open to stimulate students for advanced research with broad view and deep insights.

Advanced Experiments and Exercises in Solid State Chemistry I (4.0credits) (固体化学特別実験及び演習　I)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Chemistry		
Starts 1	1 Spring and Autumn Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose
To understand the synthesis and characterization methods of various functional materials, and their applications. You can synthesize and evaluate low-dimensional materials and perform state of the art researches relating nanomaterials.

●Prerequisite Subjects
Electron microscopy, Crystal diffractometry, Spectroscopy, Inorganic chemistry, Environmental chemistry, Analytical chemistry, Inorganic reaction chemistry, Crystal physics, Experimental safety science

●Course Topics
Experiments and discussion about
1. Synthesis of functional materials
2. Evaluation of functional materials
3. Application of functional materials

●Textbook
Experimental documents are distributed.

●Additional Reading
A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014
Reference information such as scientific paper will be given, when necessary.

●Grade Assessment
The evaluation of learning results will be performed by the experimentations (50%) and the reports (50%). Credits will be awarded to those students who score 60 or more.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
N/A

●Contacting Faculty
Professors will answer the questions whenever required.

Advanced Experiments and Exercises in Solid State Chemistry II (4.0credits) (固体化学特別実験及び演習　II)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Chemistry		
Starts 1	2 Spring and Autumn Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this experiment and practice is to deepen understanding of physical properties of nano-space materials such as crystal structure and gas adsorption, and conduct research based on original ideas and to acquire the ability of research skills by conducting synthesis, X-ray diffraction measurement and physical property measurement of nano-space materials.

Through these experiments and exercises, students will be able to acquire techniques for synthesizing, analyzing structures and measuring physical properties of nano-space materials based on metal complexes. In addition, it will be possible to conduct research on the development of nano-space materials with original ideas.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Matrials

●Course Topics

Synthesis experiments of nanoporous metal complexes
Crystal structural analysis of nanoporous metal complexes
Properties measurements of nanoporous metal complexes
Gas adsorption measurements
Research presentations for results and discussion

Study and understand the relevant literature before experiments and exercises. After the experiments and exercises, organize and analyze the data and give sufficient consideration.

●Textbook

Specify as appropriate as the progresses of this course.

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the progresses of this course.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Advanced Experiments and Exercises in Solid State Chemistry II (4.0credits) (固体化学特別実験及び演習　II)

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen
Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Advanced Experiments and Exercises in Solid State Chemistry II (4.0credits) (固体化学特別実験及び演習　II)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Chemistry		
Starts 1	2 Spring and Autumn Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this experiment and exercise is to develop the ability to discover new materials and new functions and to develop basic academic skills to solve the issues logically in the challenge of creating new materials that support a sustainable society.
By the end of this course, students will understand the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, students will be able to deepen their understanding of the technologies required for the creation of ceramic/organic polymer materials in medicine (biomaterials) through experimental training and acquire research techniques on the synthesis and analysis of biomaterials.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Students will work on the following experiments and exercises.

1. Synthesis of glass-ceramics
2. Synthesis of orgnaic-inorganic hybrids
3. Microstructure of glass-ceramcs
4. Properties of the hybrids
5. Functional evaluation of proteins
6. Summary and evaluation

Students should make a plan for the safe experiments.
Students should review research papers that are provided in the course.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.

Other references will be introduced during the class as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude and reports.
Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the course.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Advanced Experiments and Exercises in Solid State Chemistry II (4.0credits) (固体化学特別実験及び演習　II)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Chemistry	
Starts 1	2 Spring and Autumn Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose

To study on the techniques for eco-friendly manufacturing and functional improvement of the novel inorganic nanomaterials.

●Prerequisite Subjects

Microscopy, Spectroscopy, Inorganic Chemistry, Resource Chemistry, Environmental Chemistry, Physical Chemistry, Analytical Chemistry, Inorganic Reaction Chemistry

●Course Topics

Literature review of current research is made on the functional nano carbon and ceramics materials with discussion for development of appropriate treatments and process.References such as scientific papers will be provided in the classes for further reading.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment

Students should understand important contents of solid-state materials chemistry. The evaluation is performed by examinations and reports. Credits will be awarded to those students who score 60 or more. Grades are as follows: <Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

No specific requirements.

●Contacting Faculty

Spontaneous questions from students are welcome. Discussions on the topics will be open to stimulate students for advanced research with broad view and deep insights.

Advanced Experiments and Exercises in Solid State Chemistry II (4.0credits) (固体化学特別実験及び演習　II)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Chemistry		
Starts 1	2 Spring and Autumn Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following the Advanced Experiments and Exercises in Solid State Chemistry I,
to understand the synthesis and characterization methods of functional materials, and their applications. You can synthesize and evaluate low-dimensional materials and perform state of the art researches relating nanomaterials.

●Prerequisite Subjects

Electron microscopy, Crystal diffractometry, Spectroscopy, Inorganic chemistry, Environmental chemistry, Analytical chemistry, Inorganic reaction chemistry, Crystal physics, Experimental safety science
Advanced Experiments and Exercises in Solid State Chemistry I

●Course Topics

Experiments and discussion about
1. Synthesis of functional materials
2. Evaluation of functional materials
3. Application of functional materials

●Textbook

Experimental documents are distributed.

●Additional Reading

A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014
Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

The evaluation of learning results will be performed by the experimentations (50%) and the reports (50%).
Credits will be awarded to those students who score 60 or more.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions whenever required.

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.

Laboratory Visit 1 U2 (2.0credits) (研究室ローテーション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
	Chemical Systems Engineering	Department of Energy Engineering	Department of Applied Energy
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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

Up to 20 days research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U3 (3.0credits) (研究室ローテーション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
	Chemical Systems Engineering	Department of Energy Engineering	Department of Applied Energy
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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

21 days or more and 40 days or less research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U4 (4.0credits) (研究室ローテーション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
	Chemical Systems Engineering	Department of Energy Engineering	Department of Applied Energy
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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

41 days or more and 60 days or less research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U6 (6.0credits) (研究室ローテーション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
	Chemical Systems Engineering	Department of Energy Engineering	Department of Applied Energy
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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

61 days or more and 80 days or less research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U8 (8.0credits) (研究室ローテーション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
	Chemical Systems Engineering	Department of Energy Engineering	Department of Applied Energy
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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

81 days or more research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Ethics and Security in Engineering (2.0credits) (工学のセキュリティと倫理)

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	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	
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	
Lecturer	Hideo KISHIDA Professor		

●Course Purpose

The aim of the lecture is to understand ethics, intellectual property rights, information security required at the start of master thesis research. After taking this course, the students are expected to have abilities on:

1. Understanding of ethics for engineers
2. Understanding of ethics for researchers
3. Understanding of intellectual property rights
4. Understanding of information security

●Prerequisite Subjects

None because this is one of the common basic subject for future activity as a researcher or an engineer.

●Course Topics

1)Introduction
2)Ethics for engineers
3)Ethics for researchers
4)Intellectual property rights
5)Information security
6)Summary

Submission of the report after each class is mandatory.

●Textbook

Instead of using textbook, original lecture notes will be provided at each class.

●Additional Reading

Original lecture notes will be provided at each class.

●Grade Assessment

Credits will be awarded to those students who score 'Pass' based on the reports and /or subjects given by each lecture.

●Notes

None because this is one of the common basic subject for future activity as a researcher or an engineer.

This lecture will be given in an on-demand format using NUCT. In each lecture (1st lecture: Apr. 11), the course materials should be downloaded from the NUCT. If you cannot access the NUCT site of this lecture, please contact the instructor (Kishida, kishida@nagoya-u.jp) by e-mail with your name and student number. Even in this case, the registration is required.

●Contacting Faculty

After each class student can ask questions through the message function of NUCT.
Otherwise, contact to:
Prof. Kishida kishida@nagoya-u.jp

The exchange of opinions among the students can be made through the message function of NUCT.

Seminar on medical engineering (2.0credits) (医工連携セミナー)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Materials Process Engineering	Chemical Systems Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace 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	
Lecturer	Associated Faculty		

●Course Purpose

In the coming decades with growing overage population, novel technologies and outstanding ideas for the new breakthrough strategy of tailor-made medical therapy is strongly required. For the establishment of such strategy, basic technologies that enable the detection and diagnosis of molecular dynamics should be investigated. In this class, we try to educate young researchers to step out to this new frontier by setting various types of classes held by very advanced researchers in medical engineering field in Nagoya University. The lecturers are invited from engineering faculty and medical faculty, and introduce the expected ideas and the most recent achievements in the aspect of medical engineering.

1. Explain the importance of medical engineering research
2. Explain the outline of medical engineering research in Nagoya University
3. Explain the potential engineering ability needed for committing in medical engineering field

●Prerequisite Subjects

Clinical medicine, Molecular biology, Biological engineering, Biomechanics, Robotics, Medical engineering, Bioinformatics

●Course Topics

In every lecture, different lectures invited from different fields (engineer, doctors, etc.) teach the most recent advances in the field of medical engineering.

The following viewpoint will be focused

1. Propose the engineering techniques needed in clinical research or treatment
2. Propose the analytical methods for clinical research or treatment
3. Introduce the engineering techniques with high potency for clinical research

The lecture is mostly presented by power point, and for some classes, handouts are provided.

●Textbook

Not specified, but distributed handouts if necessary.

●Additional Reading

It will be appointed if necessary.

●Grade Assessment

Reports (80%) and interview (20%)

●Notes

Not needed

●Contacting Faculty

At lecture 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 Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Associated Faculty

●Course Purpose
The objective of this lecture is that students become a researcher/engineer who can create and drive the next generation of "engineering and technology", and combines expertise as well as comprehensiveness with an international perspective. As an internship, he/she will perform employment experience related to his/her major and future career for a certain period of time. Under the supervising of the receiving company, we learn the experience in the necessity of learning socially-accepted idea and learn how academics are related. Besides, we confirm the mental attitude for going to society and cultivate the ability of creation with knowledge and wisdom learned at universities and graduate schools.

●Prerequisite Subjects
Chemistry, Physics, Biology, your major subjects

●Course Topics
The content varies depending on the situation of each receiving company. As an example, there are the following contents. 1. Safety education 2. Visit factory/laboratory 3. Understanding the background of the research purpose at factories/laboratories 4. Experiments, simulations, etc. on specific themes 5. Meeting on reviewing research progress 6. Meeting on accomplishment report on own themes

●Textbook
Whether textbook is needed or not depending on the situation of each hosting company.

●Additional Reading
Whether reference is needed or not depending on the situation of each hosting company.

●Grade Assessment
Attendance record and reports, and pass 60 points or more out of 100

●Notes
TBA; Contact with your supervisor and mentor.

●Contacting Faculty
Please contact the internship instructor or your supervisor.

International Cooperative Research Project U2 (2.0credits) (国際共同研究 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
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

●Course Purpose

The purpose of this international project is to develop young researchers who have comprehensive and international abilities and can play an active role internationally.

Through this project, students will be able to
1) make an original research plan and perform it.
2) communicate and discuss with other foreign researchers in English fluently.
3) enhance their research and presentation skills.

●Prerequisite Subjects

Basic engineering classes, English, Technical English

●Course Topics

Experience R & D at overseas research institutes as follows.
1) Set a research theme and make a research plan based on discussions with overseas supervisors and conduct research.
2) Present your research results in English at your place of stay and discuss.
3) After returning to Japan, report the contents of research activities to the supervisor and receive comprehensive evaluation.

●Textbook

Will be designated by the supervisor in the visiting university (or research group).

●Additional Reading

Will be designated by the supervisor in the visiting university (or research group).

●Grade Assessment

Receive the evaluation of the instructor in your stay regarding the theme setting, research ability, and discussion method at the joint research destination. After returning to Japan, submit and present a report to the supervisor of the University. If the above results are comprehensively evaluated and it is deemed that sufficient research achievement ability has been acquired, the credits will be awarded.

●Notes

TBA; Contact with your supervisor and mentor.

●Contacting Faculty

Ask to the supervisors in Nagoya university and visiting research group.

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

●Course Purpose

The purpose of this international project is to develop young researchers who have comprehensive and international abilities and can play an active role internationally.Through this project, students will be able to1) make an original research plan and perform it.2) communicate and discuss with other foreign researchers in English fluently.3) enhance their research and presentation skills.

●Prerequisite Subjects

Basic engineering classes, English, Technical English

●Course Topics

Experience R & D at overseas research institutes as follows.1) Set a research theme and make a research plan based on discussions with overseas supervisors and conduct research.2) Present your research results in English at your place of stay and discuss.3) After returning to Japan, report the contents of research activities to the supervisor and receive comprehensive evaluation.

●Textbook

Will be designated by the supervisor in the visiting university (or research group).

●Additional Reading

Will be designated by the supervisor in the visiting university (or research group).

●Grade Assessment

Receive the evaluation of the instructor in your stay regarding the theme setting, research ability, and discussion method at the joint research destination. After returning to Japan, submit and present a report to the supervisor of the University. If the above results are comprehensively evaluated and it is deemed that sufficient research achievement ability has been acquired, the credits will be awarded.

●Notes

TBA; Contact with your supervisor and mentor.

●Contacting Faculty

Ask to the supervisors in Nagoya university and visiting research group.

International Cooperative Research Project U4 (4.0credits) (国際共同研究 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
Starts 1	1 Spring and Autumn Semester	1 Spring and Autumn Semester	1 Spring and Autumn Semester
Lecturer	Associated Faculty	Associated Faculty	Associated Faculty

●Course Purpose

The purpose of this international project is to develop young researchers who have comprehensive and international abilities and can play an active role internationally.

Through this project, students will be able to
1) make an original research plan and perform it.
2) communicate and discuss with other foreign researchers in English fluently.
3) enhance their research and presentation skills.

●Prerequisite Subjects

Basic engineering classes, English, Technical English

●Course Topics

Experience R & D at overseas research institutes as follows.
1) Set a research theme and make a research plan based on discussions with overseas supervisors and conduct research.
2) Present your research results in English at your place of stay and discuss.
3) After returning to Japan, report the contents of research activities to the supervisor and receive comprehensive evaluation.

●Textbook

Will be designated by the supervisor in the visiting university (or research group).

●Additional Reading

Will be designated by the supervisor in the visiting university (or research group).

●Grade Assessment

Receive the evaluation of the instructor in your stay regarding the theme setting, research ability, and discussion method at the joint research destination. After returning to Japan, submit and present a report to the supervisor of the University. If the above results are comprehensively evaluated and it is deemed that sufficient research achievement ability has been acquired, the credits will be awarded.

●Notes

TBA; Contact with your supervisor and mentor.

●Contacting Faculty

Ask to the supervisors in Nagoya university and visiting research group.

Overview of space exploration and research (2.0credits) (宇宙研究開発概論)

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 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		
Lecturer	Leading Graduate		

●Course Purpose

This lecture course helps students to acquire a wide-ranging, panoramic knowledge of space research and development given by variety of lecturers from different academic fields.

●Prerequisite Subjects

Basic mathematics, Basic physics

●Course Topics

1. Space Exploration Projects
1.1 Overview of Space Exploration and Research
1.2 Space Projects
1.3 International Satellite and Spacecraft (HTV) Development
1.4 Project Management/Systems Engineering
1.5 Intelectual Properties in Business

2. Space Explorations on Observations
2.1 Space Propulsion Engineering
2.2 Materials Development for Space Applications
2.3 Space Observation Technologies
2.4 Introduction to Radiation Detectors and Electronics

3. Space-related Science
3.1 Foundations of Astrophysics
3.2 Earth and Planetary Science
3.3 Space Environment Science
3.4 Simulation Experiments

Report subject will be given at every lecture. The report should be submitted by the given deadline.

●Textbook

We do not specify the textbook. Lecture notes will be given as necessary.

●Additional Reading

Recommended readings will be give during lectures as necessary.

●Grade Assessment

Report must be submitted for each lecture. Proper understanding of each lecture's contents is evaluated. Passing average point is 60 out of 100.

●Notes

Students in "Leadership program for Space exploration and Research" are required to take this course before the qualifying examination.This course is open to any graduate students in Nagoya University.

●Contacting Faculty

Inquire contact method from the lecturer after the lecture

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

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.

International special lecture (1.0credits) (国際協働教育特別講義)

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 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		
Lecturer	Associated Faculty		

●Course Purpose

Gain basic knowledge of general engineering through English lectures on various hot research topics and leading technologies. The objective of this lecture is to develop research abilities and communication skills, which are essential to carry out international collaborative researches.

●Prerequisite Subjects

Basic engineering subjects, English, Technical English

●Course Topics

Depends on the lecturer.This course will be divided in 4 chapters as follows:1. Setting theme and reviewing literature2. Designing research plan3. Analysis and discussion of results4. Brief summary and future prospectsHomework will be given after the class and the report is required to be submitted in next class.

●Textbook

Will be designated by the lecturer.

●Additional Reading

Will be designated by the lecturer.

●Grade Assessment

Written report and evaluation by the professors.

●Notes

No conditions for taking the course.

●Contacting Faculty

In the class and E-mail.

International language exercise (1.0credits) (国際協働教育外国語演習)

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Exercise		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Applied Physics	Materials Physics	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		
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to provide Japanese students with the English classes or provide international students with Japanese classes to improve communication skills for both academic and daily life.

●Prerequisite Subjects

English, Technical English, Japanese

●Course Topics

Wide variety of exercises including speaking, listening, writing, reading, and presentation in Japanese/English.Homework will be given after the class and the report is required to be submitted in next class.

●Textbook

Will be designated by the lecturer.

●Additional Reading

Will be designated by the lecturer.

●Grade Assessment

Report, presentation, participation in discussionGrading will be based on understanding Japanese and English, and communication performance.

●Notes

No conditions for taking the course.

●Contacting Faculty

Acceptance and response in the class or through E-mail.

Seminar on Applied Physical Chemistry 2A (2.0credits) (応用物理化学セミナー 2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

In this seminar, we will develop researchers and engineers who have the ability to create and lead the next generation of "engineering and technology" and combine rich expertise with advanced comprehensiveness and a broad international perspective. We aim to improve our internationality, leadership, and connection with society in our specialized fields. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined mainly from the following topics, considering the latest scientific trends and the progress in research of each student.1 Analysis of catalytic reactions by reaction kinetics2 Understanding catalytic reactions by thermodynamics and quantum chemistry3 Basics and applications of spectroscopyFour. Solid surface phenomenaFive. Basics and applications of industrial catalysts6 Resources and energy chemistry7 Topics in catalytic chemistry and material chemistryBefore the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.(1) Oral presentation at the seminar(2) Contribution to discussionThe acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Students who can understand and explain papers in the field of catalysts.Classes are basically face-to-face or conducted by online.Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.A. Satsuma: satsuma@chembio.nagoya-u.ac.jpK. Sawabe : sawabe@chembio.nagoya-u.ac.jpA. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2A (2.0credits) (応用物理化学セミナー 2A)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Spring Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in the size range from atom scale to nanometer scale and then obtain skills to design and fabricate efficient energy conversion systems using well-organized materials.
Goals and objectives
1. To understand the physicochemical properties of metal and semiconductor nano-materials and to explain their changes depending on the sizes.
2. To design novel efficient energy conversion systems by combining reported phenomena and original ideas.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to quantitatively evaluate the efficiency of these systems.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cell
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.
A passing score is 60/100.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2A (2.0credits) (応用物理化学セミナー 2A)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Spring Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 2A (2.0credits) (応用物理化学セミナー 2A)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Spring Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.Achievement target2: You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.2. By the day of your literature introduction, read a paper related to your doctor's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.3. You propose ideas to advance your doctor's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.You can select papers should be read and introduced according to your doctoral thesis research.

●Additional Reading

Instructed during class as needed.

●Grade Assessment

Evaluate the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2B (2.0credits) (応用物理化学セミナー 2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

In this seminar, we will develop researchers and engineers who have the ability to create and lead the next generation of "engineering and technology" and combine rich expertise with advanced comprehensiveness and a broad international perspective. We aim to improve our internationality, leadership, and connection with society in our specialized fields. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined mainly from the following topics, considering the latest scientific trends and the progress in research of each student.1 Analysis of catalytic reactions by reaction kinetics2 Understanding catalytic reactions by thermodynamics and quantum chemistry3 Basics and applications of spectroscopy4. Solid surface phenomena5. Basics and applications of industrial catalysts6 Resources and energy chemistry7 Topics in catalytic chemistry and material chemistryBefore the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.(1) Oral presentation at the seminar(2) Contribution to discussionThe acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Students who can understand and explain papers in the field of catalysts.Classes are basically face-to-face or conducted by online.Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.A. Satsuma: satsuma@chembio.nagoya-u.ac.jpK. Sawabe : sawabe@chembio.nagoya-u.ac.jpA. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2B (2.0credits) (応用物理化学セミナー 2B)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Autumn Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in the size range from atom scale to nanometer scale and then obtain skills to design and fabricate efficient energy conversion systems using well-organized materials.
Goals and objectives
1. To understand the physicochemical properties of metal and semiconductor nano-materials and to explain their changes depending on the sizes.
2. To design novel efficient energy conversion systems by combining reported phenomena and original ideas.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to quantitatively evaluate the efficiency of these systems.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cell
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.
A passing score is 60/100.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2B (2.0credits) (応用物理化学セミナー 2B)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Autumn Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 2B (2.0credits) (応用物理化学セミナー 2B)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	1 Autumn Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.

Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.
Achievement target2: You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.
2. By the day of your literature introduction, read a paper related to your doctor's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.
3. You propose ideas to advance your doctor's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.
You can select papers should be read and introduced according to your doctoral thesis research.

●Additional Reading

Instructed during class as needed.

●Grade Assessment

Evaluate the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:
Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2C (2.0credits) (応用物理化学セミナー 2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

In this seminar, we will develop researchers and engineers who have the ability to create and lead the next generation of "engineering and technology" and combine rich expertise with advanced comprehensiveness and a broad international perspective. We aim to improve our internationality, leadership, and connection with society in our specialized fields. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined mainly from the following topics, considering the latest scientific trends and the progress in research of each student.1 Analysis of catalytic reactions by reaction kinetics2 Understanding catalytic reactions by thermodynamics and quantum chemistry3 Basics and applications of spectroscopy4. Solid surface phenomena5. Basics and applications of industrial catalysts6 Resources and energy chemistry7 Topics in catalytic chemistry and material chemistryBefore the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.(1) Oral presentation at the seminar(2) Contribution to discussionThe acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Students who can understand and explain papers in the field of catalysts.Classes are basically face-to-face or conducted by online.Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.A. Satsuma: satsuma@chembio.nagoya-u.ac.jpK. Sawabe : sawabe@chembio.nagoya-u.ac.jpA. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2C (2.0credits) (応用物理化学セミナー 2C)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Spring Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in the size range from atom scale to nanometer scale and then obtain skills to design and fabricate efficient energy conversion systems using well-organized materials.
Goals and objectives
1. To understand the physicochemical properties of metal and semiconductor nano-materials and to explain their changes depending on the sizes.
2. To design novel efficient energy conversion systems by combining reported phenomena and original ideas.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to quantitatively evaluate the efficiency of these systems.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cell
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.
A passing score is 60/100.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2C (2.0credits) (応用物理化学セミナー 2C)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Spring Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 2C (2.0credits) (応用物理化学セミナー 2C)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Spring Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.Achievement target2: You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.2. By the day of your literature introduction, read a paper related to your doctor's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.3. You propose ideas to advance your doctor's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.You can select papers should be read and introduced according to your doctoral thesis research.

●Additional Reading

Instructed during class as needed.

●Grade Assessment

Evaluated the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2D (2.0credits) (応用物理化学セミナー 2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

In this seminar, we will develop researchers and engineers who have the ability to create and lead the next generation of "engineering and technology" and combine rich expertise with advanced comprehensiveness and a broad international perspective. We aim to improve our internationality, leadership, and connection with society in our specialized fields. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary probl

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined mainly from the following topics, considering the latest scientific trends and the progress in research of each student.
1 Analysis of catalytic reactions by reaction kinetics
2 Understanding catalytic reactions by thermodynamics and quantum chemistry
3 Basics and applications of spectroscopy
4. Solid surface phenomena
5. Basics and applications of industrial catalysts
6 Resources and energy chemistry
7 Topics in catalytic chemistry and material chemistry
Before the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.
(1) Oral presentation at the seminar
(2) Contribution to discussion
The acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.
(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Students who can understand and explain papers in the field of catalysts.
Classes are basically face-to-face or conducted by online.
Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.
A. Satsuma: satsuma@chembio.nagoya-u.ac.jp
K. Sawabe : sawabe@chembio.nagoya-u.ac.jp
A. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2D (2.0credits) (応用物理化学セミナー 2D)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Autumn Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in the size range from atom scale to nanometer scale and then obtain skills to design and fabricate efficient energy conversion systems using well-organized materials.Goals and objectives 1. To understand the physicochemical properties of metal and semiconductor nano-materials and to explain their changes depending on the sizes. 2. To design novel efficient energy conversion systems by combining reported phenomena and original ideas. Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to quantitatively evaluate the efficiency of these systems.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods 2. Photoelectrochemistry 3. Solar cell 4. Photocatalysis 5. Designing functional materials through control of the nanostructurePlease read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.A passing score is 60/100.

●Notes

No special requirement.Classes will be conducted both face-to-face and remotely.Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail. Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2D (2.0credits) (応用物理化学セミナー 2D)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Autumn Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

Report and discussion

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 2D (2.0credits) (応用物理化学セミナー 2D)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	2 Autumn Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.

Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.
Achievement target2:
You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.
2. By the day of your literature introduction, read a paper related to your doctor's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.
3. You propose ideas to advance your doctor's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.
You can select papers should be read and introduced according to your doctoral thesis research.

●Additional Reading

Instructed during class as needed.

●Grade Assessment

Evaluated the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:
Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2E (2.0credits) (応用物理化学セミナー 2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	3 Spring Semester		
Lecturer	Atsushi Satsuma Professor	Kyoichi SAWABE Lecturer	Akira ODA Assistant Professor

●Course Purpose

In this seminar, we will develop researchers and engineers who have the ability to create and lead the next generation of "engineering and technology" and combine rich expertise with advanced comprehensiveness and a broad international perspective. We aim to improve our internationality, leadership, and connection with society in our specialized fields. In the lectures, we will improve our research skills based on basic studies. We read the relevant literature on solid catalysts, inorganic functional materials, material design on the crystal surface, and structural analysis and related fields, to make a review paper of the literature. We will learn how to summarize, how to deeply understand the research trends in related fields. We will acquire information gathering and organizing skills, basic and applied science skills, persuasive skills, and logical thinking skills. Through this lecture, we will confirm the basic skills of the learning so far and gain a comprehensive understanding while acquiring the applied skills related to solid catalysts. We need to have quantitative skills, information literacy, logical thinking skills, problem solving skills, thinking skills, comprehensive use of knowledge, skills, attitudes, etc., and the ability to solve voluntary problems.

●Prerequisite Subjects

Catalysis, surface science, kinetics, thermodynamics, quantum chemistry, physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, and related chemistry

●Course Topics

Lectures are conducted in a seminar. The topics will be determined mainly from the following topics, considering the latest scientific trends and the progress in research of each student.1 Analysis of catalytic reactions by reaction kinetics2 Understanding catalytic reactions by thermodynamics and quantum chemistry3 Basics and applications of spectroscopy4. Solid surface phenomena5. Basics and applications of industrial catalysts6 Resources and energy chemistry7 Topics in catalytic chemistry and material chemistryBefore the seminar, the member should prepare a review document for the topic, and explain in the lecture. Comprehension is confirmed through questions and discussions with participants.

●Textbook

Research papers, reviews, and books about related area.

●Additional Reading

Research papers, reviews, and books about related area.

●Grade Assessment

The followings are used as evaluation points.(1) Oral presentation at the seminar(2) Contribution to discussionThe acceptance criteria are to correctly understand physical chemistry, catalytic chemistry, and quantum chemistry and explain them in an easy-to-understand manner.(Evaluation criteria) A total score of 60/100 points or higher will be accepted.

●Notes

Students who can understand and explain papers in the field of catalysts.Classes are basically face-to-face or conducted by online.Materials will be distributed via the laboratory server.

●Contacting Faculty

Discussion after the class or e-mail to the following address.A. Satsuma: satsuma@chembio.nagoya-u.ac.jpK. Sawabe : sawabe@chembio.nagoya-u.ac.jpA. Oda : akira@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2E (2.0credits) (応用物理化学セミナー 2E)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	3 Spring Semester	
Lecturer	Tsukasa TORIMOTO Professor	TatsuyaKAMEYAMA Associate Professor

●Course Purpose

In this seminar, we will understand the phenomena at the interfaces in the size range from atom scale to nanometer scale and then obtain skills to design and fabricate efficient energy conversion systems using well-organized materials.
Goals and objectives
1. To understand the physicochemical properties of metal and semiconductor nano-materials and to explain their changes depending on the sizes.
2. To design novel efficient energy conversion systems by combining reported phenomena and original ideas.
Through these, we will understand basic photochemical and electrochemical concepts for the fabrication of energy conversion systems and then develop the skills to quantitatively evaluate the efficiency of these systems.

●Prerequisite Subjects

Physical Chemistry, Electrochemistry, Photochemistry, and Catalysis

●Course Topics

1. Electrochemical methods
2. Photoelectrochemistry
3. Solar cell
4. Photocatalysis
5. Designing functional materials through control of the nanostructure

Please read the designated parts of the textbook or documents before each class.

●Textbook

Textbooks will be notified at the beginning of this course.

●Additional Reading

Reference books will be notified at the beginning of this course.

●Grade Assessment

The evaluation of learning results will be carried out by oral examinations.
A passing score is 60/100.

●Notes

No special requirement.
Classes will be conducted both face-to-face and remotely.
Ask questions to the teacher by email (torimoto@chembio.nagoya-u.ac.jp).

●Contacting Faculty

Discussion is welcome during and after the class, or with e-mail.
Contact address: torimoto@chembio.nagoya-u.ac.jp

Seminar on Applied Physical Chemistry 2E (2.0credits) (応用物理化学セミナー 2E)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	3 Spring Semester
Lecturer	Koichi KIKUTA Professor

●Course Purpose

The purpose of this course is to search and discuss on the novel inorganic materials and processing concerning on energy conversion. It is also aimed to learn how to apply these information to their own research.

●Prerequisite Subjects

Basic chemistry, Inorganic reaction chemistry, Inorganic materials chemistry, Analytical chemistry, Catalyst and surface chemistry

●Course Topics

Literature review of current research on solid oxide fuel cell, energy conversion, and energy reserve with discussion.

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Applied Physical Chemistry 2E (2.0credits) (応用物理化学セミナー 2E)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Chemistry
Starts 1	3 Spring Semester
Lecturer	Jun KUMAGAI Associate Professor

●Course Purpose

The aim of this course is to introduce various instrumental analysis methods (especially magnetic resonance spectroscopy) necessary for researches in radiation chemistry, radiation biology, and photocatalytic chemistry, by reading specialized books and by introducing related papers published in specialized journals. Exploring research trends in related fields is also the aim of this course.Achievement target1: You can provide appropriate analytical methods for your research materials and analyze the spectra correctly.Achievement target2: You will be able to make presentations that can correctly convey what you want to convey to others.

●Prerequisite Subjects

Quantum Chemistry 1 and Exercise, Quantum Chemistry 2 and Exercise, Thermodynamics 1 and Exercise, Thermodynamics 2 and Exercise, Analytical Chemistry 1 and Exercise, Analytical Chemistry 2 and Exercise, Analytical Chemistry 3, Inorganic Chemistry 1, Exercise and Organic Chemistry 1 and Exercise

●Course Topics

1. You read related technical books, explain the contents to the instructor, and confirm that you understand correctly.2. By the day of your literature introduction, read a paper related to your doctor's thesis research carefully,, and summarize it in PowerPoint. Introduce the summarized contents to the instructor and students using PowerPoint and discuss the research contents.3. You propose ideas to advance your doctor's thesis research, and discuss the proposals with the instructor and students.

●Textbook

The instructor selects textbooks.You can select papers should be read and introduced according to your doctoral thesis research.

●Additional Reading

Instructed during class as needed.

●Grade Assessment

Evaluated the degree of achievement of the goal by oral presentation at the seminar and Q & A session. Oral presentation and Q & A are 60% and 40%, respectively.

●Notes

No course requirements are required.

●Contacting Faculty

The instructor:Jun Kumagai, Ph.D.; Associate Professor; Phone: 2591; Email: kumagai@imass.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2A (2.0credits) (固体化学セミナー 2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2A (2.0credits) (固体化学セミナー 2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop ability to promote original research based on a broad perspective and advanced expertise in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will gain advanced knowledge on the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, these knowledge can apply to discuss the technology necessary for the creation of materials in medicine (biomaterials), acquire research techniques for the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. General demands on biomaterials
2. Definitions of biomaterials and their properties
3. Definitions of ceramic materials and sintering behavior
4. Synthesis of ceramics
5. Microstructure and properties of ceramics
6. Synthesis of proteins by genetic engineering
7. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2A (2.0credits) (固体化学セミナー 2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Spring Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

The lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.
You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Electron microscopy, Crystal diffractometry, Spectroscopy, Inorganic chemistry, Environmental chemistry, Analytical chemistry, Inorganic reaction chemistry, Crystal physics

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials
3. Applications of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.

●Additional Reading

A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014

Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 2A (2.0credits) (固体化学セミナー 2A)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Spring Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
Understanding of the studies on functional materials and training of how to establish the research thema for doctral thesis.

●Prerequisite Subjects
Seminor on Solid State Chemistry 1A-1D

●Course Topics
Literature review of current research is made on design of nano-structured materials.

●Textbook
Seminar documents are distributed. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications (2nd Edition), Guozhong Cao and Ying Wang, World Scientific, 2010

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
The evaluation of learning results will be performed by the presentations (50%) and the reports (50%). Credits will be awarded to those students who score 60 or more. Grades are as follows: S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
We have office hours after the seminar and accept questions about seminar contents.

Seminar on Solid State Chemistry 2B (2.0credits) (固体化学セミナー 2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose
The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects
Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics
Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook
Specify as appropriate as the seminar progresses

●Additional Reading
Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment
The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes
Nothing
The lecture will be given in person.

●Contacting Faculty
Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2B (2.0credits) (固体化学セミナー 2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop ability to promote original research based on a broad perspective and advanced expertise in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will gain advanced knowledge on the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, these knowledge can apply to discuss the technology necessary for the creation of materials in medicine (biomaterials), acquire research techniques for the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. Phase diagram and formation of glass
2. Structure and properties of glass
3. Crystalization of liquid
4. Synthesis of glass-ceramics
5. Surface reaction of glass in body environment
6. Structure, properties and functions of biopolymers
7. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2B (2.0credits) (固体化学セミナー 2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	1 Autumn Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following the Solid State Chemistry Seminar 2A, this lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.
You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Electron microscopy, Crystal diffractometry, Spectroscopy, Inorganic chemistry, Environmental chemistry, Analytical chemistry, Inorganic reaction chemistry, Crystal physics
Seminar on Solid State Chemistry 2A

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials
3. Applications of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.

●Additional Reading

A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014
Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 2B (2.0credits) (固体化学セミナー 2B)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	1 Autumn Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
Understanding of the studies on functional materials and training of how to establish the research thema for doctral thesis.

●Prerequisite Subjects
Seminor on Solid State Chemistry 2A

●Course Topics
Literature review of current research is made on synthesis of nano-structured materials.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Seminar documents are distributed. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications (2nd Edition), Guozhong Cao and Ying Wang, World Scientific, 2010

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
The evaluation of learning results will be performed by the presentations (50%) and the reports (50%). Credits will be awarded to those students who score 60 or more. Grades are as follows: S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
We have office hours after the seminar and accept questions about seminar contents.

Seminar on Solid State Chemistry 2C (2.0credits) (固体化学セミナー 2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2C (2.0credits) (固体化学セミナー 2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop ability to promote original research based on a broad perspective and advanced expertise in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will gain advanced knowledge on the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, these knowledge can apply to discuss the technology necessary for the creation of materials in medicine (biomaterials), acquire research techniques for the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. Analysis of reaction between glass and body fluid
2. Design of bioactive materials
3. Biomimetic processing
4. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2C (2.0credits) (固体化学セミナー 2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Spring Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following the Solid State Chemistry Seminar 2B, this lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.
You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Electron microscopy, Crystal diffractometry, Spectroscopy, Inorganic chemistry, Environmental chemistry, Analytical chemistry, Inorganic reaction chemistry, Crystal physics
Seminars on Solid State Chemistry 2A, 2B

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials
3. Applications of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.

●Additional Reading

A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014
Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 2C (2.0credits) (固体化学セミナー 2C)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Spring Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
Understanding of the studies on functional materials and training of how to establish creative researches.

●Prerequisite Subjects
Seminor on Solid State Chemistry 2A, 2B

●Course Topics
Literature review of current research is made on properties characterization of nano-structured materials.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Seminar documents are distributed. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications (2nd Edition), Guozhong Cao and Ying Wang, World Scientific, 2010

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
The evaluation of learning results will be performed by the presentations (50%) and the reports (50%). Credits will be awarded to those students who score 60 or more. Grades are as follows: S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
We have office hours after the seminar and accept questions about seminar contents.

Seminar on Solid State Chemistry 2D (2.0credits) (固体化学セミナー 2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment

The level of achievement to the goal will be evaluated in reports and presentations.
Pass if you understand the basics of inorganic and coordination compounds, and reflect your grades accordingly if you have acquired more advanced knowledge and acquired the academic ability to use it.

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2D (2.0credits) (固体化学セミナー 2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop ability to promote original research based on a broad perspective and advanced expertise in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will gain advanced knowledge on the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, these knowledge can apply to discuss the technology necessary for the creation of materials in medicine (biomaterials), acquire research techniques for the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. Organic-inorganic hybrids
2. Hyperthermia with ceramic materials
3. Biomaterials for tissue regeneration
4. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2D (2.0credits) (固体化学セミナー 2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	2 Autumn Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following the Solid State Chemistry Seminar 2C, this lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.
You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Electron microscopy, Crystal diffractometry, Spectroscopy, Inorganic chemistry, Environmental chemistry, Analytical chemistry, Inorganic reaction chemistry, Crystal physics
Seminars on Solid State Chemistry 2A, 2B, 2C

●Course Topics

1. Synthesis of functional materials
2. Properties of functional materials
3. Applications of functional materials

Discussion and debate are necessary.
Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.

●Additional Reading

A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014
Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).
Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 2D (2.0credits) (固体化学セミナー 2D)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	2 Autumn Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
Understanding of the studies on functional materials and training of how to establish creative researches.

●Prerequisite Subjects
Seminor on Solid State Chemistry 2A, 2B, 2C

●Course Topics
Literature review of current research is made on microstructure analysis of nano-structured materials.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Seminar documents are distributed. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications (2nd Edition), Guozhong Cao and Ying Wang, World Scientific, 2010

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
The evaluation of learning results will be performed by the presentations (50%) and the reports (50%). Credits will be awarded to those students who score 60 or more. Grades are as follows: S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
We have office hours after the seminar and accept questions about seminar contents.

Seminar on Solid State Chemistry 2E (2.0credits) (固体化学セミナー 2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	3 Spring Semester		
Lecturer	Ryoutarou MATSUDA Professor	SEN Susan Designated Associate Professor	Hiroaki IGUCHI Associate Professor
	Shinpei KUSAKA Assistant Professor		

●Course Purpose

The purpose of this course is to understand the basics, applications and the latest research on the synthesis, structure and function of nanospace materials based on metal complexes.

By mastering this seminar, students will be able to explain the basic and advanced content related to the synthesis, structure and function of nanospace materials based on metal complexes. Students will also gain knowledge about the latest research on nanoporous compounds in the world.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises, Inorganic Chemistry 2 with Exercises, Chemistry of Inorganic Reaction, Chemistry of Inorganic Materials

●Course Topics

Chemistry of metal complexes
Syntheses of nanoporous metal complexes
Structures of nanoporous metal complexes
Functions of nanoporous metal complexes
Adsorption chemistry

Read the handouts before the seminar. After the seminar, deepen the knowledge of the related researches by reading papers introduced.

●Textbook

Specify as appropriate as the seminar progresses

●Additional Reading

Solid State Chemistry and its Applications,2nd Edition, Wiley, Anthony R. West

Additionally, other books will be introduced as appropriate as the lecture progresses.

●Grade Assessment

Class participation, presentation and report:
Criteria score range for passing: 100-60
(S:100-90, A:89-80, B:79-70, C:69-60)

●Notes

Nothing
The lecture will be given in person.

●Contacting Faculty

Professors will answer questions in the lecture or professor's rooms.

Contact information:
Professor Ryotaro Matsuda
Tel:4603/ Email: ryotaro.matsuda@chembio.nagoya-u.ac.jp
Designated Associate Professor Susan Sen

Tel:5114/ Email: sen.susan@chembio.nagoya-u.ac.jp
Assistant Professor Shinpei Kusaka
Tel:5114/ Email: shinpei.kusaka@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2E (2.0credits) (固体化学セミナー 2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	3 Spring Semester		
Lecturer	Chikara OHTUKI Professor	Ayae Narutaki Professor	Kazushi FUJIMOTO Assistant Professor

●Course Purpose

The purpose of this seminar is to develop ability to promote original research based on a broad perspective and advanced expertise in the challenge of creating new materials that support a sustainable society.

By the end of this seminar, students will gain advanced knowledge on the biological functions of inorganic solid materials (ceramics) required for developing artificial bones and artificial teeth and organic polymer materials that contribute to tissue engineering. In addition, these knowledge can apply to discuss the technology necessary for the creation of materials in medicine (biomaterials), acquire research techniques for the development of biomaterials, and develop the imagination of material development.

●Prerequisite Subjects

Inorganic Chemistry, Chemistry of Inorganic Reaction, Inorganic Material Chemistry, Thermodynamics, Analytical Chemistry, Biochemistry, Physical Chemistry of Macromolecules

●Course Topics

Seminars on the following contents will be given.

1. Biomaterials and medicine
2. Biomaterials and ethics
3. Cooperative researches of materials science and medicine
4. Summary and evaluation

Students should prepare materials necessary for discussion by the day of the seminar.
Students should review the contents of the seminar by reading reference papers provided in the seminar.

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

Bioceramics and their clinical applications, Ed. by T. Kokubo, Woodhead Publishing Limited, 2008.
Bioceramics: Properties, Characterizations, and Applications, J. Park, Springer, 2008.
Principles of Ceramics Processing, 2nd Edition, J. S. Reed, John Wiley and Sons, Inc. 1995.

Other references will be introduced during the seminar as necessary.

●Grade Assessment

The evaluation of learning results will be performed by the participation attitude, oral presentation, and the answers to the questions. Credits will be awarded to those students who score 60 or more.
Grades are as follows:
<Enrollees after 2020>
A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.
<Enrollees before 2019>
S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

There are no requirements to take the seminar.

●Contacting Faculty

Questions outside the hours are accepted in the lecture room or teachers' room after the seminar. Otherwise, contact the instructor by e-mail in advance.

Contact information:
Professor Chikara Ohtsuki (ohtsuki@chembio.nagoya-u.ac.jp)
Professor Ayae Sugawara-Narutaki (ayae@energy.nagoya-u.ac.jp)
Lecturer Jin Nakamura (nakamura@chembio.nagoya-u.ac.jp)
Assistant Professor Kazushi Fujimotok-fuji@chembio.nagoya-u.ac.jp

Seminar on Solid State Chemistry 2E (2.0credits) (固体化学セミナー 2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Chemistry		
Starts 1	3 Spring Semester		
Lecturer	OSADA Minoru Professor	KOBAYASHI Makoto Associate Professor	YAMAMOTO Eisuke Assistant Professor

●Course Purpose

Following the Solid State Chemistry Seminar 2D, this lecture is based on seminar of low-dimensional functional material synthesis and their properties. Besides, presentation skill is also trained.You can learn fundamental concepts on synthesis and analysis ways of low-dimensional materials and perform state of the art nanomaterial researches.

●Prerequisite Subjects

Electron microscopy, Crystal diffractometry, Spectroscopy, Inorganic chemistry, Environmental chemistry, Analytical chemistry, Inorganic reaction chemistry, Crystal physicsSeminars on Solid State Chemistry 2A, 2B, 2C, 2D

●Course Topics

1. Synthesis of functional materials 2. Properties of functional materials 3. Applications of functional materialsDiscussion and debate are necessary.Reference information such as scientific paper will be given, when necessary. Cited papers and citing papers in suggested papers should be read and understood.

●Textbook

Seminar documents are distributed.

●Additional Reading

A. R. West: Solid State Chemistry and its Applications (2nd Edition), Wiley, 2014Reference information such as scientific paper will be given, when necessary.

●Grade Assessment

Presentation (50%), attitude (30%) and reports (20%).Low-dimensional functional material synthesis and their properties should be understood properly. Credits will be awarded to those students who understand nanomaterials.<Enrollees after 2020>A+: 100-95, A: 94-80, B: 79-70, C: 69-65, C-: 64-60, F: 59-0.<Enrollees before 2019>S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes

N/A

●Contacting Faculty

Professors will answer the questions after each seminar.

Seminar on Solid State Chemistry 2E (2.0credits) (固体化学セミナー 2E)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Chemistry	
Starts 1	3 Spring Semester	
Lecturer	NAKANISHI Kazuki Professor	Joji HASEGAWA Designated Associate Professor

●Course Purpose
Understanding of the studies on functional materials and training of how to establish creative researches.

●Prerequisite Subjects
Seminor on Solid State Chemistry 2A-2D

●Course Topics
Literature review of current research is made on applications of nano-structured materials.References such as scientific papers will be provided in the classes for further reading.

●Textbook
Seminar documents are distributed. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications (2nd Edition), Guozhong Cao and Ying Wang, World Scientific, 2010

●Additional Reading
A.R. West "Solid State Chemistry and its Applications", Wiley; 2nd Edition

●Grade Assessment
The evaluation of learning results will be performed by the presentations (50%) and the reports (50%). Credits will be awarded to those students who score 60 or more. Grades are as follows: S: 100-90, A: 89-80, B: 79-70, C: 69-60, F: 59-0.

●Notes
No specific requirements.

●Contacting Faculty
We have office hours after the seminar and accept questions about seminar contents.

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.

Seminar on medical engineering (2.0credits) (医工連携セミナー)

Course Type	Comprehensive engineering courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Molecular and Macromolecular Chemistry	Materials Chemistry	Biomolecular Engineering
	Materials Process Engineering	Chemical Systems Engineering	Mechanical Systems Engineering
	Micro-Nano Mechanical Science and Engineering	Aerospace Engineering	
Starts 1	Spring Semester	Spring Semester	Spring Semester
	Spring Semester	Spring Semester	Spring Semester
	Spring Semester	Spring Semester	
Lecturer	Associated Faculty		

●Course Purpose

In the coming decades with growing overage population, novel technologies and outstanding ideas for the new breakthrough strategy of tailor-made medical therapy is strongly required. For the establishment of such strategy, basic technologies that enable the detection and diagnosis of molecular dynamics should be investigated. In this class, we try to educate young researchers to step out to this new frontier by setting various types of classes held by very advanced researchers in medical engineering field in Nagoya University. The lecturers are invited from engineering faculty and medical faculty, and introduce the expected ideas and the most recent achievements in the aspect of medical engineering.

●Prerequisite Subjects

Clinical medicine, Molecular biology, Biological engineering, Biomechanics, Robotics, Medical engineering, Bioinformatics

●Course Topics

In every lecture, different lectures invited from different fields (engineer, doctors, etc.) teach the most recent advances in the field of medical engineering. The lecture is mostly presented by power point, and for some classes, handouts are provided.

●Textbook

Not specified, but distributed handouts if necessary.

●Additional Reading

It will be appointed if necessary.

●Grade Assessment

Reports (80%) and interview (20%)

●Notes

Not needed

●Contacting Faculty

At lecture time

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.

Laboratory Visit 1 U2 (2.0credits) (研究室ローテーション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	Chemical Systems Engineering
	Electrical Engineering	Electronics	Information and Communication Engineering
	Mechanical Systems Engineering	Micro-Nano Mechanical Science and Engineering	Aerospace 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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

Up to 20 days research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U3 (3.0credits) (研究室ローテーション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	Chemical Systems Engineering
	Electrical Engineering	Electronics	Information and Communication Engineering
	Mechanical Systems Engineering	Micro-Nano Mechanical Science and Engineering	Aerospace 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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

21 days or more and 40 days or less research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U4 (4.0credits) (研究室ローテーション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	Chemical Systems Engineering
	Electrical Engineering	Electronics	Information and Communication Engineering
	Mechanical Systems Engineering	Micro-Nano Mechanical Science and Engineering	Aerospace 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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

41 days or more and 60 days or less research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U6 (6.0credits) (研究室ローテーション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	Chemical Systems Engineering
	Electrical Engineering	Electronics	Information and Communication Engineering
	Mechanical Systems Engineering	Micro-Nano Mechanical Science and Engineering	Aerospace 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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

61 days or more and 80 days or less research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●Contacting Faculty

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

Laboratory Visit 1 U8 (8.0credits) (研究室ローテーション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	Chemical Systems Engineering
	Electrical Engineering	Electronics	Information and Communication Engineering
	Mechanical Systems Engineering	Micro-Nano Mechanical Science and Engineering	Aerospace 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
Lecturer	Associated Faculty		

●Course Purpose

The aim of this course is to expand the student’s ability as a researcher by conducting a research at a different laboratory and learn different methods and ways of thinking, as well as communicate with other researchers in related fields.By completing the course, the students are expected to acquire various research methods and ways of thinking, and gain the ability to tackle research problems from multiple angles.

●Prerequisite Subjects

Basic and specialized subjects related to the research subject

●Course Topics

Students will conduct research at a different laboratory. The host laboratory will be chosen based on the participant’s research field and interest from other laboratories within the campus, other universities, research institutes and companies. The course consists of the following contents.1. Theme setting and literature review2. Formulating the research plan3. Analyzing the results and discussion4. Presentation of the resultsAfter the class, students should review the analyzing process of the obtained 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

81 days or more research in the host laboratory and submitting a report is a prerequisite. Evaluation will be based on the student's report and the evaluation by the supervisor in the host laboratory. 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. Grading will be decided from P (pass) or NP (not passed).

●Notes

Nothing particularly needed

●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.