Introduction to Engineering Physics (2.0credits) (物理工学のすすめ)

Course Type	Basic Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Applied Physics	Materials Physics
Starts 1	1 Spring Semester	1 Spring Semester
Lecturer	Associated Faculty	Associated Faculty

●Course Purpose
Students learn fundamental issues and research activities in the departments of Applied Physics and Materials Physics.

●Prerequisite Subjects
it is desired to have have basic knowledge of physics such as mechanics, electromagnetism, statistical mechanics, and quantum mechanics.

●Course Topics
(1)Research contents of Department of Applied Physics and related basic contents
(2)Research contents of Department of Materials Science and related basic contents

Submition of the reports are required. In addition, the keywords related to the research activities of each research group should be surveyed prior to the class.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
(Evaluation method)Evaluate the level of achievement for the target based on the submitted report.

(Evaluation criteria)
Understanding and explaining the basic concepts and terms related to the field of physical engineering.

●Notes
Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty
Questions are welcome after each lecture. It is recommended to contact the lecturer in advance by e-mail.
e-mail address: uneyama@mp.pse.nagoya-u.ac.jp

l Discussion on Materials Science (High Pressure Materials Science) A (2.0credits) (物質科学特別輪講（高圧力物

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

The pressure is an important thermodynamics parameter which bridges the fundamental aspects in physics, chemistry, biology, and earth science, etc.In order to understand the role of pressure on the materials science deeply, the basic knowledge for solid-state chemistry and physics is required.The aim of this class is to learn and master the fundamental subject for studying the advanced high-pressure materials science.

●Prerequisite Subjects

Electromagnetism, thermodynamics, quantum mechanics, crystallography, inorganic chemistry, solid state physics

●Course Topics

1. Crystal chemistry at high pressure2. Crystal structure and chemical bonding under high pressure3. Fundamental of High-pressure synthesis method4. Crystallography and diffraction

●Textbook

●Additional Reading

Will be introduced in the class.

●Grade Assessment

class participation and oral presentation

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

l Discussion on Materials Science (High Pressure Materials Science) B (2.0credits) (物質科学特別輪講（高圧力物

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

The pressure is an important thermodynamics parameter which bridges the fundamental aspects in physics, chemistry, biology, and earth science, etc. The summer semester was focusing on mastering the fundamental knowledge for studying high-pressure materials science. Further advanced content will be introduced in this seminar.

●Prerequisite Subjects

Electromagnetics, thermodynamics, quantum mechanics, crystallography, inorganic chemistry, solid-state physics, magnetism, dielectrics, microscopy analysis

●Course Topics

1. Chemical bonding and crystal chemistry of inorganic materials2. Crystal structure under high pressure3. High pressure synthesis and analytical methods4. Electrical and magnetic properties, optical properties

●Textbook

●Additional Reading

Will be introduced in the class.

●Grade Assessment

class participation and oral presentation

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

g and Discussion on Materials Science (Spintronic Engineering) A (2.0credits) (物質科学特別輪講（スピン物性工

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

This seminar consists mainly of reading journal papers. In the seminar, students introduce journal papers, specialized reference books, and self-confident research related to each research theme, and broadens the understanding of the basics and applications of the research field. Achievement goal:Understanding the characteristics of semiconductor materials and acquire systematic knowledge that leads to the comprehensive and creative abilities necessary for research and development by reading various technical literatures and considering the results of experiments

●Prerequisite Subjects

Electromagnetism, Quantum mechanics, Crystallography, Solid state physics, Magnetsim

●Course Topics

1. Reading academic journal papers and reference books on spintronics and nanoelectronics. 2. Introducing their research results. Students make presentation and discussion how to interpret data and mathematical expressions, and how to apply the reported knowledge to your own research, through reading journal papers and detailed consideration of experimental results.Read related section before each lecture. Summarize the lecture and solve example problems in the text book by yourself after lecture.

●Textbook

Journal papers and reference books for textbook will be selected with students.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

The degree of achievement is evaluated through oral presentations and Q&A to presentations.

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Dealing during lecture.

g and Discussion on Materials Science (Spintronic Engineering) B (2.0credits) (物質科学特別輪講（スピン物性工

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

This seminar consists mainly of reading journal papers. In the seminar, students introduce journal papers, specialized reference books, and self-confident research related to each research theme, and broadens the understanding of the basics and applications of the research field.Achievement goal:Understanding the characteristics of magnetic and spintronic materials and acquire systematic knowledge that leads to the comprehensive and creative abilities necessary for research and development by reading various technical literatures and considering the results of experiments.

●Prerequisite Subjects

Electromagnetics, Quantum mechanics, Crystallography, Solid-state physics, Magnetsim

●Course Topics

1. Reading academic journal papers and reference books on semiconductor integrated circuits and nanoelectronics. 2. Introducing their research results. Students make presentation and discussion how to interpret data and mathematical expressions, and how to apply the reported knowledge to your own research, through reading journal papers and detailed consideration of experimental results.Read related section before each lecture. Summarize the lecture and solve example problems in the text book by yourself after lecture.

●Textbook

Journal papers and reference books for textbook will be selected with students.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

The degree of achievement is evaluated through oral presentations and Q&A to presentations.

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Dealing during lecture.

d Discussion on Materials Science (Materials Nanoscince and Design) A (2.0credits) (物質科学特別輪講（材料設

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Circle form	
Course Name	Materials Physics	
Starts 1	1 Spring Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
In this lecture, students should read textbooks and literature of statistical mechanics and thermodynamics, and will make presentation and discussions.

●Prerequisite Subjects
Statistical mechanics, Thermodynamics, Chemical Physics

●Course Topics
This lecture proceeds based on the text book.

Students should prepare resumes for their presentations.

●Textbook
Terrell L. Hill
"An Introduction to Statistical Thermodynamics"
Dover Publications, 1987.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to statistical mechanics and thermodynamics.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

d Discussion on Materials Science (Materials Nanoscince and Design) B (2.0credits) (物質科学特別輪講（材料設

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Circle form	
Course Name	Materials Physics	
Starts 1	1 Autumn Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
In this lecture, students should read textbooks and literature of crystal defect theory and nano-scale structure analyses, and will make presentation and discussions.

●Prerequisite Subjects
Condensed Matter Physics

●Course Topics
This lecture proceeds based on the text book.

Students should prepare resumes for their presentations.

●Textbook
D. Hull and D. J. Bacon
"Introduction to Dislocations", Fifth Edition
Butterworth-Heinemann, 2011

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to crystal defect theory and nanoscale analytical techniques.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

ding and Discussion on Materials Science (Solid-State Device) A (2.0credits) (物質科学特別輪講（結晶デバイス

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar consists mainly of reading journal papers. In the seminar, students introduce journal papers, specialized reference books, and self-confident research related to each research theme, and broadens the understanding of the basics and applications of the research field.Achievement goal:Understanding the characteristics of semiconductor materials and acquire systematic knowledge that leads to the comprehensive and creative abilities necessary for research and development by reading various technical literatures and considering the results of experiments

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics, Electromagnetics

●Course Topics

1. Reading academic journal papers and reference books on semiconductor integrated circuits and nanoelectronics. 2. Introducing their research results. Students make presentation and discussion how to interpret data and mathematical expressions, and how to apply the reported knowledge to your own research, through reading journal papers and detailed consideration of experimental results.Read related section before each lecture. Summarize the lecture and solve example problems in the text book by yourself after lecture.

●Textbook

Journal papers and reference books for textbook will be selected with students.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make presentations and Q&A appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during lecture.

ding and Discussion on Materials Science (Solid-State Device) B (2.0credits) (物質科学特別輪講（結晶デバイス

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar consists mainly of reading journal papers. In the seminar, students introduce journal papers, specialized reference books, and self-confident research related to each research theme, and broadens the understanding of the basics and applications of the research field.Achievement goal:Understanding the characteristics of semiconductor materials and acquire systematic knowledge that leads to the comprehensive and creative abilities necessary for research and development by reading various technical literatures and considering the results of experiments

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics, Electromagnetics

●Course Topics

1. Reading academic journal papers and reference books on semiconductor integrated circuits and nanoelectronics. 2. Introducing their research results. Students make presentation and discussion how to interpret data and mathematical expressions, and how to apply the reported knowledge to your own research, through reading journal papers and detailed consideration of experimental results.Read related section before each lecture. Summarize the lecture and solve example problems in the text book by yourself after lecture.

●Textbook

Journal papers and reference books for textbook will be selected with students.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make better presentations and Q&A, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during lecture.

d Discussion on Materials Science (Electronic Properties of Materials) A (2.0credits) (物質科学特別輪講（電子物

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

In this course, the students will read a textbook or a review article related to electronic properties of materials. The participants will be divided into a few groups. By explaining the contents of the assigned part of the reading material and through thorough discussion with the other participants, the students are expected to gain a better and deeper understanding of the subject. At the end of the course, the students are expected to have deepened fundamental knowledges that are necessary for studying material properties and the overall ability to analyze and understand the material properties from various aspects, and developed the ability to apply those knowledges to actual problems.

●Prerequisite Subjects

Quantum Mechanics, Thermodynamics, Statistical Physics, Electromagnetism, Solid State Physics

●Course Topics

The course material will be selected from the following subjects taking into consideration the research field of the participants.1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Magnetic materials 5. Topological materials 6. Crystal growthThe students are required to read the designated reading materials before the class. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

A textbook or a review article that will be selected taking into consideration the research field of the participants.

●Additional Reading

Instruct as needed.

●Grade Assessment

Evaluated based on presentation (60%) and discussion (40%) in the class. Students have to demonstrate basic understanding of the subject dealt in the reading materials to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the class by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".Classes will be held face-to-face.

●Contacting Faculty

During the course or at the office upon reservation.Contact address:　Hiroshi Ikuta, ikuta_at_mp.pse.nagoya-u.ac.jp

d Discussion on Materials Science (Electronic Properties of Materials) B (2.0credits) (物質科学特別輪講（電子物

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

In this course, the students will read a textbook or a review article related to electronic properties of materials. The participants will be divided into a few groups. By explaining the contents of the assigned part of the reading material and through thorough discussion with the other participants, the students are expected to gain a better and deeper understanding of the subject. At the end of the course, the students are expected to have deepened fundamental knowledges that are necessary for studying material properties and the overall ability to analyze and understand the material properties from various aspects, and developed the ability to apply those knowledges to actual problems.

●Prerequisite Subjects

Quantum Mechanics, Thermodynamics, Statistical Physics, Electromagnetism, Solid State Physics

●Course Topics

The course material will be selected from the following subjects taking into consideration the research field of the participants.1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Magnetic materials 5. Topological materials 6. Crystal growthThe students are required to read the designated reading materials before the class. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

A textbook or a review article that will be determined taking into consideration the research field of the students.

●Additional Reading

Instruct as needed.

●Grade Assessment

Evaluated based on presentation (60%) and discussion (40%) in the class. Students have to demonstrate basic understanding of the subject dealt in the reading materials to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the class by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

●Contacting Faculty

During the course or at the office upon resevation.

cussion on Materials Science (Frontiers for Computational Physics) A (2.0credits) (物質科学特別輪講（フロンテ

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: The students are encouraged to acquire fundamental knowledge and analytical methods by reading and discussion on the scientific as well as engineering aspects in the computational physics, through the original papers, books, and the related web sites.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics A Mechanics of Continuum, Physics of Fluids, Applied Mathematics

●Course Topics

1. Materials science, electronic device2. Computational science of fluid, turbulence phenomena, Crystal growth 3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

We introduce text books in the lecture.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

cussion on Materials Science (Frontiers for Computational Physics) B (2.0credits) (物質科学特別輪講（フロンテ

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: The students are encouraged to acquire fundamental knowledge and analytical methods in the scientific as well as engineering aspects in the computational physics by reading and discussion. They are also encouraged to master the skills of the presentation and discussions. The students should read texts in advance.Attainment target: The students acquire the systematic knowledge necessary for actual research and development by the deep understanding of computational physics.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics A Mechanics of Continuum, Physics of Fluids, Applied Mathematics, Reading and Discussion on Materials Science (Frontier for Computational Physics) A

●Course Topics

1. Materials science, electronic device2. Computational science of fluid, turbulence phenomena, Crystal growth 3. Numerical methods

●Textbook

We introduce text books in the lecture.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Materials Science (Materials science by electron nano-scopic spectroscopy) A (2.0credits) (物質科学特別輪講

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

The purpose of this seminar is to learn the fundamental principles of electron diffraction and imaging theories of transmission electron microscopy in the form of students taking turns reading and explaining a fundamenta textbook.

●Prerequisite Subjects

●Course Topics

●Textbook

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

Materials Science (Materials science by electron nano-scopic spectroscopy) B (2.0credits) (物質科学特別輪講（

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

The purpose of this seminar is to learn the fundamental principles of electron diffraction and imaging theories of transmission electron microscopy in the form of students taking turns reading and explaining a fundamenta textbook. In particular, seminar B focuses on hardware of the electron microscopes.

●Prerequisite Subjects

●Course Topics

●Textbook

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

n on Materials Science (Quantum Beam Materials Science and Engineering) A (2.0credits) (物質科学特別輪講（量

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Circle form
Course Name	Materials Physics
Starts 1	1 Spring Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To acquire the basic knowledge necessary for studying X-ray optics.Achievement goal: To read various specialized literatures, deepen the understanding of quantum beam engineering, and acquire systematic knowledge that leads to the comprehensive and creativity necessary for research and development.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

Survey the latest topics for a master's or graduate thesis and introduce the related article.

●Textbook

It will be given according to the topics.

●Additional Reading

It will be given according to the topics.

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

at seminar

n on Materials Science (Quantum Beam Materials Science and Engineering) B (2.0credits) (物質科学特別輪講（量

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Circle form
Course Name	Materials Physics
Starts 1	1 Autumn Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To acquire the basic knowledge necessary for studying X-ray optics.Achievement goal: To read various specialized literatures, deepen the understanding of quantum beam engineering, and acquire systematic knowledge that leads to the comprehensive and creativity necessary for research and development.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

Survey the latest topics for a master'thesis and introduce the related article.

●Textbook

It will be given accorfding to the topics.

●Additional Reading

It will be given accorfding to the topics.

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

at seminar

and Discussion on Materials Science (Physics of Rheology) A (2.0credits) (物質科学特別輪講（レオロジー物理工

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose

This course will be based on text books written by outstanding researchers in rheology, soft-matter physics and related fields of research on the fundamental and advanced topics.Objective: To be able to read and understand basic and current topics related to rheology and soft matter physics from books, and to be able to communicate them appropriately to others.

●Prerequisite Subjects

Thermodynamics, statistical physics, softmatter physics, polymer chemical physics,

●Course Topics

The participants will be requested to read the book chapters, and to explain the contents. The participants are expected to stimulate the discussion on the issue and the related topics among themselves.

●Textbook

To be announced by the lecturer.

●Additional Reading

To be announced by the lecturer.

●Grade Assessment

The credit will be awarded to the participants who exhibit sufficient knowledge of rheology and logical discussion during the session. The score may vary according to the quality of the presentation made by the participant, and his behaviors during the discussion.

●Notes

Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

To be announced by the lecturer.

and Discussion on Materials Science (Physics of Rheology) B (2.0credits) (物質科学特別輪講（レオロジー物理工

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Circle form		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose

This course will be based on text books written by outstanding researchers in rheology, soft-matter physics and related fields of research on the fundamental and advanced topics.Objective: To be able to read and understand basic and current topics related to rheology and soft matter physics from books, and to be able to communicate them appropriately to others.

●Prerequisite Subjects

Thermodynamics, statistical physics, softmatter physics, polymer chemical physics,

●Course Topics

The participants will be requested to read the book chapters, and to explain the contents. The participants are expected to stimulate the discussion on the issue and the related topics among themselves.

●Textbook

To be announced from the lecturer.

●Additional Reading

To be announced from the lecturer.

●Grade Assessment

The credit will be awarded to the participants who exhibit sufficient knowledge of rheology and logical discussion during the session. The score may vary according to the quality of the presentation made by the participant, and his behaviors during the discussion.

●Notes

Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

To be announced from the lecturer.

Seminar on High pressure materials science 1A (2.0credits) (高圧力物質科学セミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

The research trend related to the materials synthesis and crystal growth process at high pressure and temperature and each one's research progress reports should be presented and discussed. It promotes greater understanding of the trend of a related field and an original way to advance the research.

●Prerequisite Subjects

Crystal physics, Transport phenomena, Material physicochemical, Statistical mechanics A, Inorganic chemistry, Material mechanics, Material physics, Materials process mathematics, Numerical analysis, Solid state physics, Analysis chemistry 2, Material stre

●Course Topics

1. Principle, techniques and apparatuses related to high pressure and temperature generation 2. Material synthesis and single crystal growth at high pressure and temperature 3. Charactrization methods, techniques and apparatuses of crystal structure

●Textbook

Will be introduced in the class

●Additional Reading

Will be introduced in the class

●Grade Assessment

Oral presentaion and question and answer

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on High pressure materials science 1B (2.0credits) (高圧力物質科学セミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

The research trend related to the materials synthesis and crystal growth process at high pressure and temperature and each one's research progress reports should be presented and discussed. It promotes greater understanding of the trend of a related field and an original way to advance the research.

●Prerequisite Subjects

Crystal physics, Transport phenomena, Material physicochemical, Statistical mechanics A, Inorganic chemistry, Material mechanics, Material physics, Materials process mathematics, Numerical analysis, Solid state physics, Analysis chemistry 2, Material stre

●Course Topics

1. Principle, techniques and apparatuses related to high pressure and temperature :generation:2. Material synthesis and single crystal growth at high pressure and temperature:3. Charactrization methods, techniques and apparatuses of crystal structure at h

●Textbook

Will be introduced in the class

●Additional Reading

Will be introduced in the class

●Grade Assessment

Oral presentaion and question and answer:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on High pressure materials science 1C (2.0credits) (高圧力物質科学セミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

The research trend related to the materials synthesis and crystal growth process at high pressure and temperature and each one's research progress reports should be presented and discussed. It promotes greater understanding of the trend of a related field and an original way to advance the research.

●Prerequisite Subjects

Crystal physics, Transport phenomena, Material physicochemical, Statistical mechanics A, Inorganic chemistry, Material mechanics, Material physics, Materials process mathematics, Numerical analysis, Solid state physics, Analysis chemistry 2, Material stre

●Course Topics

1. Principle, techniques and apparatuses related to high pressure and temperature :generation:2. Material synthesis and single crystal growth at high pressure and temperature:3. Charactrization methods, techniques and apparatuses of crystal structure at h

●Textbook

Will be introduced in the class

●Additional Reading

Will be introduced in the class

●Grade Assessment

Oral presentaion and question and answer:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on High pressure materials science 1D (2.0credits) (高圧力物質科学セミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose
The research trend related to the materials synthesis and crystal growth process at high pressure and temperature and each one's research progress reports should be presented and discussed. It promotes greater understanding of the trend of a related field and an original way to advance the research.

●Prerequisite Subjects
Crystal physics, Transport phenomena, Material physicochemical, Statistical mechanics A, Inorganic chemistry, Material mechanics, Material physics, Materials process mathematics, Numerical analysis, Solid state physics, Analysis chemistry 2, Material stre

●Course Topics
1. Principle, techniques and apparatuses related to high pressure and temperature :generation:2. Material synthesis and single crystal growth at high pressure and temperature:3. Charactrization methods, techniques and apparatuses of crystal structure at h

●Textbook
Will be introduced in the class.

●Additional Reading
Will be introduced in the class.

●Grade Assessment
Oral presentaion and question and answer:

●Notes
Announcements may be delivered via NUCT.

●Contacting Faculty
Questions are welcome within or after each lecture or via NUCT.
Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on Spintronic Engineering 1A (2.0credits) (スピン物性工学セミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of spintronic materials in the world.:Final goal::1) To explain the industrial applications of : physical and spintronic properties of materials.:2) To explain a trend of the future : investigation on spintronic materials.

●Prerequisite Subjects

Electromagnetic theory, Physics of crystal, Quantum mechanics, Physical properties of materials, Magnetic materials.

●Course Topics

1. Basic theory and experimental methods on : crystal structures, magnetic properties, : electric properties of materials.:2. Basic theory and experimental methods on : thermal, elastic and optical properties of : materials.:3. Preparation of the magnetic thin films and nano-particle. 4. Analysis of crystal structure. 5. Analysis of surface and interface structure. 6. Advanced research subjects on magnetism.

●Textbook

The reference print is distributed.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

Evaluated based on oral presentation and discussion during the seminar.

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Spintronic Engineering 1B (2.0credits) (スピン物性工学セミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of magnetic materials in the world.:Final goal::1) To explain the basic theory of magnetism.:2) To analyze the basic data on magnetic of : properties, theoretically.:3) To explain an outline for the trend of : investigations on physical properties of : materials in the world.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Magnetic materials, Seminar on magnetics 1A

●Course Topics

1. Basic theory and experimental methods on : crystal structures, magnetic properties, : electric properties of materials.:2. Basic theory and experimental methods on : thermal, elastic and optical properties of : materials.:3. Preparation of the ultra th

●Textbook

The reference print is distributed.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Spintronic Engineering 1C (2.0credits) (スピン物性工学セミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of magnetic materials in the world.:Final goal::1) To analyze many kinds of data on physical and : magnetic properties of materials.:2) To present the own investigation on magnetism : of materials.:3) To propose a theme for a basic investigation : on magnetic properties of materials.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Magnetic materials,Seminar on magnetics 1A to 1B

●Course Topics

1. Basic theory and experimental methods on : crystal structures, magnetic properties, : electric properties of materials.:2. Basic theory and experimental methods on : thermal, elastic and optical properties of : materials.:3. Preparation of the ultra th

●Textbook

The reference print is distributed.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Spintronic Engineering 1D (2.0credits) (スピン物性工学セミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of spintronic materials in the world.:Final goal::1) To explain the industrial applications of : physical and spintronic properties of materials.:2) To explain a trend of the future : investigation on spintronic materials.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Magnetic materials, Seminar on magnetics 1A to 1C

●Course Topics

1. Basic theory and experimental methods on : crystal structures, magnetic properties. : electric properties of materials.:2. Basic theory and experimental methods on : thermal, elastic and optical properties of : materials.:3. Preparation of the ultra th

●Textbook

The reference print is distributed.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Materials Design and theory 1A (2.0credits) (材料設計工学セミナー1A)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	1 Spring Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose

In this seminar, students should investigate scientific papers of recent materials researches regarding electronic structure theory and nano-scale materials structure analyses, and can understand essences of the researches through presentation and the following discussion with other students and staff.

●Prerequisite Subjects

Quantum mechanics, Chemical Physics

●Course Topics

1. Band structure of crystals
2. Electronic structures of crystal defects
3. How to calculate band structures of crystals
4. Experimental nanoscale analyses of materials

Students should prepare resumes before each lectures.

●Textbook

There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading

There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment

1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to band-structure theory and nanoscale experimental analyses.

●Notes

There are no specific course requirements.

●Contacting Faculty

Questions are welcome during and after each lecture.

Seminar on Materials Design and theory 1B (2.0credits) (材料設計工学セミナー1B)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	1 Autumn Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
In this seminar, students should investigate scientific papers of recent materials researches regarding electronic structure theory and nano-scale materials structure analyses, and can understand essences of the researches through presentation and the following discussion with other students and staff.

●Prerequisite Subjects
Quantum mechanics, Chemical Physics

●Course Topics
1. Band structure of crystals
2. Electronic structures of crystal defects
3. How to calculate band structures of crystals
4. Experimental nanoscale analyses of materials

Students should prepare resumes before each lectures.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to band-structure theory and nanoscale experimental analyses.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Materials Design and theory 1C (2.0credits) (材料設計工学セミナー1C)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	2 Spring Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
In this seminar, students should investigate scientific papers of recent materials researches regarding electronic structure theory and nano-scale materials structure analyses, and can understand essences of the researches through presentation and the following discussion with other students and staff.

●Prerequisite Subjects
Quantum mechanics, Chemical Physics

●Course Topics
1. Band structure of crystals
2. Electronic structures of crystal defects
3. How to calculate band structures of crystals
4. Experimental nanoscale analyses of materials

Students should prepare resumes before each lectures.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to band-structure theory and nanoscale experimental analyses.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Materials Design and theory 1D (2.0credits) (材料設計工学セミナー1D)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	2 Autumn Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
In this seminar, students should investigate scientific papers of recent materials researches regarding electronic structure theory and nano-scale materials structure analyses, and can understand essences of the researches through presentation and the following discussion with other students and staff.

●Prerequisite Subjects
Quantum mechanics, Chemical Physics

●Course Topics
1. Band structure of crystals
2. Electronic structures of crystal defects
3. How to calculate band structures of crystals
4. Experimental nanoscale analyses of materials

Students should prepare resumes before each lectures.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to band-structure theory and nanoscale experimental analyses.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Solid-State Device Science 1A (2.0credits) (結晶デバイスセミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar consists of lectures and research introductions. The purpose of the seminar is to learn the basics of semiconductor physical properties and solid state physics, which are essentially important for conducting research on semiconductor devices and semiconductor materials. In addition, in the course of research introduction, students introduce their own research and academic papers related to the lectures, and will obtain understanding of the basics and applications of their research fields and broaden their horizons.
Objectives: To obtain a systematic understanding of the characteristics of semiconductor materials and to obtain the comprehensive and creative knowledge necessary for research and development.

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics, Electromagnetics

●Course Topics

1. Properties of Energy Bands
1-1. Energy-Band Calculations
1-2. Density of States in Energy Bands
1-3. Electron Velocity and Electrical Properties
1-4. The Band Model and Electron Properties
1-5. Energy Bands in Real Crystals
1-6. Excitons and polarons
1-7. Bands and bonds
2. Carrier transport
2-1. Wavwe packets
2-2. The Boltzmann equation and it's solution
2-3. Electrical conductivity in the relaxation-time approximation
2-4. Electrical conductivity in semiconductors and metals
2-5. Thermal conductivity due to electrons
2-6. Thermoelectric effect

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

R. H. Bube, "Electronic Properties of Crystalline Solids" etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make presentations and Q&A appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Solid-State Device Science 1B (2.0credits) (結晶デバイスセミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar will consist of lectures and reading academic journal papers. The purpose of this seminar is to understand electron transport mechanism in semiconductor devices and various phenomena occurring on semiconductor surfaces and interfaces based on basic physics. In addition, students take up academic journal papers related to research themes, and acquire basic knowledge and applied technologies in their research fields. Also, they acquire systematic knowledge that leads to the comprehensive capabilities required to promote individual research.
Achievement goal
1. Understanding the basic operation of the semiconductor device
2. Understanding the problems in actual semiconductor devices

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics and statistical mechanics, Electromagnetism, Electronics

●Course Topics

1. Ideal MIS Diode
2. Surface Space-Charge Region
3. Ideal MIS Curves
4. Si-SiO2 MOS Diode
5. Interface Trapped Charge
6. Measurement of Interface Trap Density: Capacitance Method
7. Measurement of Interface Trap Density: Conductance Method
8. Equivalent circuits of MOS capacitors
9. Charges in SiO2
10. Influence of workfunction difference
11. Behaviors of carriers in inversion layers

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

S. M. Sze, "Physics of Semiconductor Devices"(John Wiley & Sons) etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make presentations and question and Q&A appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Solid-State Device Science 1C (2.0credits) (結晶デバイスセミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar consists of lectures and research introductions. The purpose of the seminar is to learn the basics of semiconductor physical properties and solid state physics, which are essentially important for conducting research on semiconductor devices and semiconductor materials. In addition, in the course of research introduction, students introduce their own research and academic papers related to the lectures, and will obtain understanding of the basics and applications of their research fields and broaden their horizons. Objectives: To obtain a systematic understanding of the characteristics of semiconductor materials and to obtain the comprehensive and creative knowledge necessary for research and development.

●Prerequisite Subjects

Solid-state Physics, Quantum mechanics, Thermodynamics, Electromagnetism

●Course Topics

1. Properties of Energy Bands
1-1. Energy-Band Calculations
1-2. Density of States in Energy Bands
1-3. Electron Velocity and Electrical Properties
1-4. The Band Model and Electron Properties
1-5. Energy Bands in Real Crystals
1-6. Excitons and polarons
1-7. Bands and bonds
2. Carrier transport
2-1. Wavwe packets
2-2. The Boltzmann equation and it's solution
2-3. Electrical conductivity in the relaxation-time approximation
2-4. Electrical conductivity in semiconductors and metals
2-5. Thermal conductivity due to electrons
2-6. Thermoelectric effect

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

R. H. Bube, "Electronic Properties of Crystalline Solids", etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make presentations and question and Q&A appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Solid-State Device Science 1D (2.0credits) (結晶デバイスセミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar will consist of lectures and reading academic journal papers. The purpose of this seminar is to understand electron transport mechanism in semiconductor devices and various phenomena occurring on semiconductor surfaces and interfaces based on basic physics. In addition, students take up academic journal papers related to research themes, and acquire basic knowledge and applied technologies in their research fields. Also, they acquire systematic knowledge that leads to the comprehensive capabilities required to promote individual research.
Achievement goal
1. Understanding the basic operation of the semiconductor device
2. Understanding the problems in actual semiconductor devices

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics and statistical mechanics, Electromagnetism, Electronics

●Course Topics

1. Ideal MIS Diode
2. Surface Space-Charge Region
3. Ideal MIS Curves
4. Si-SiO2 MOS Diode
5. Interface Trapped Charge
6. Measurement of Interface Trap Density: Capacitance Method
7. Measurement of Interface Trap Density: Conductance Method
8. Equivalent circuits of MOS capacitors
9. Charges in SiO2
10. Influence of workfunction difference
11. Behaviors of carriers in inversion layers
12. Dielectric breakdown
13. Electric conduction mechanisms

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

S. M. Sze, "Physics of Semiconductor Devices", (John Wiley & Sons), etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make presentations and question and Q&A

appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Materials Physics 1A (2.0credits) (電子物性工学セミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

Classes will be held face-to-face.

●Contacting Faculty

During the seminar or at the office upon reservation.

Contact address:
Hiroshi Ikuta, ikuta_at_mp.pse.nagoya-u.ac.jp

Seminar on Materials Physics 1B (2.0credits) (電子物性工学セミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

●Contacting Faculty

During the seminar or at the office upon resevation.

Seminar on Materials Physics 1C (2.0credits) (電子物性工学セミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

Classes will be held face-to-face.

●Contacting Faculty

During the seminar or at the office upon reservation.

Contact address:
Hiroshi Ikuta, ikuta_at_mp.pse.nagoya-u.ac.jp

Seminar on Materials Physics 1D (2.0credits) (電子物性工学セミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

●Contacting Faculty

During the seminar or at the office upon resevation.

Seminar on Frontiers for Computational Physics1A (2.0credits) (フロンティア計算物理セミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: The students are encouraged to acquire fundamental knowledge and analytical methods in the scientific as well as engineering aspects in the computational physics, through the original papers, books, and the related web sites.Attainment target:The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics

●Course Topics

1. Materials science, electronic device2. Computational science of fluid, turbulence phenomena, crystal growth3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics1B (2.0credits) (フロンティア計算物理セミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Contents of the lecture: The students are encouraged to acquire fundamental knowledge and analytical methods in the scientific as well as engineering aspects in the computational physics. They are also encouraged to master the skills of the presentation and discussions.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, Crystal growth3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics1C (2.0credits) (フロンティア計算物理セミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: To deepen the understanding on mathematical and engineering problems in the computational physics, and to master analytical and computational methods in the field They are encouraged to master the skills of speaking about their research and discussions.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics, Seminar on Frontiers for Computational Physics 1AB

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, combustion3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics1D (2.0credits) (フロンティア計算物理セミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: To deepen the understanding on mathematical and engineering problems in the computational physics, and to master analytical and computational methods in the field They are encouraged to master the skills of speaking about their research and discussions.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics, Seminar on Frontiers for Computational Physics 1AB

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, combustion3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

inar on Materials science by electron nano-scopic spectroscopy 1A (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:

1. Convey their research subject to others in a clear manner
2. Dicusss the subjects by questions & answers based on their data available

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Materials science by electron nano-scopic spectroscopy 1B (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:

1. Convey their research subject to others in a clear manner
2. Dicusss the subjects by questions & answers based on their data available

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

inar on Materials science by electron nano-scopic spectroscopy 1C (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:
1. Convey their research subject to others in a clear manner
2. Dicusss the subjects by questions & answers based on their data available

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

inar on Materials science by electron nano-scopic spectroscopy 1D (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:
1. Convey their research subject to others in a clear manner
2. Dicusss the subjects by questions & answers based on their data available

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Quantum Beam Materials Science and Engineering １A (2.0credits) (量子ビーム物性工学セミナー1A

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	1 Spring Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To present, discuss and deepen understanding of each research progress related to X-ray optics, analyze trends in related fields, and learn how to proceed with original research.
Achievement goal: To acquire the comprehensive ability required for research and development of X-ray optics and the ability to apply knowledge to actual research.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

Synchrotron radiation
Interaction between X-rays and substances
Absorption, refraction, reflection, diffraction
X-ray spectroscopy
Optical element
Imaging

●Textbook

●Additional Reading

Will be introduced in the class.

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

Questions are welcome within or after each lecture.

Seminar on Quantum Beam Materials Science and Engineering １B (2.0credits) (量子ビーム物性工学セミナー1B

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	1 Autumn Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To present, discuss and deepen understanding of each research progress related to X-ray optics, analyze trends in related fields, and learn how to proceed with original research.
Achievement goal: To acquire the comprehensive ability required for research and development of X-ray optics and the ability to apply knowledge to actual research.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

Applications of synchrotron radiation
X-ray spectroscopy
X-ray optical elements
X-ray imaging

●Textbook

Will be introduced in the class

●Additional Reading

Will be introduced in the class

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

Questions are welcome within or after each lecture.

Seminar on Quantum Beam Materials Science and Engineering １C (2.0credits) (量子ビーム物性工学セミナー1C

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	2 Spring Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To present, discuss and deepen understanding of each research progress related to X-ray optics, analyze trends in related fields, and learn how to proceed with original research.
Achievement goal: To acquire the comprehensive ability required for research and development of X-ray optics and the ability to apply knowledge to actual research.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

Applications of synchrotron radiation
X-ray spectroscopy
X-ray optical elements
X-ray imaging

●Textbook

Will be introduced in the class

●Additional Reading

Will be introduced in the class

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

Questions are welcome within or after each lecture.

Seminar on Quantum Beam Materials Science and Engineering １D (2.0credits) (量子ビーム物性工学セミナー1D

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	2 Autumn Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To present, discuss and deepen understanding of each research progress related to X-ray optics, analyze trends in related fields, and learn how to proceed with original research.
Achievement goal: To acquire the comprehensive ability required for research and development of X-ray optics and the ability to apply knowledge to actual research.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

Applications of synchrotron radiation
X-ray spectroscopy
X-ray optical elements
X-ray imaging

●Textbook

Will be introduced in the class

●Additional Reading

Will be introduced in the class

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

Questions are welcome within or after each lecture.

Seminar on Physics of Rheology 1A (2.0credits) (レオロジー物理工学セミナー1A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose
Through the seminar, the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects
The other seminar courses and the lecture courses on rheology physics.

●Course Topics
For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook
Books related to rheology and/or softmatter physics

●Additional Reading
Books related to rheology and/or softmatter physics

●Grade Assessment
The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes
Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty
Come to Prof. Masubuchi (http://masubuchi.jp)

Seminar on Physics of Rheology 1B (2.0credits) (レオロジー物理工学セミナー1B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose

Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects

The other seminar courses and the lecture courses on rheology physics.

●Course Topics

For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook

Books related to rheology and/or softmatter physics

●Additional Reading

Books related to rheology and/or softmatter physics

●Grade Assessment

The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes

Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

Come to Prof. Masubuchi (http://masubuchi.jp)

Seminar on Physics of Rheology 1C (2.0credits) (レオロジー物理工学セミナー1C)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose
Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects
The other seminar courses and the lecture courses on rheology physics.

●Course Topics
For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook
Books related to rheology and/or softmatter physics

●Additional Reading
Books related to rheology and/or softmatter physics

●Grade Assessment
The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes
Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message"..

●Contacting Faculty
Come to Prof. Masubuchi (http://masubuchi.jp)

Seminar on Physics of Rheology 1D (2.0credits) (レオロジー物理工学セミナー1D)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose
Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects
The other seminar courses and the lecture courses on rheology physics.

●Course Topics
For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook
Books related to rheology and/or softmatter physics

●Additional Reading
Books related to rheology and/or softmatter physics

●Grade Assessment
The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes
Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty
Come to Prof. Masubuchi (http://masubuchi.jp)

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

●Course Purpose

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

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

●Prerequisite Subjects

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

●Course Topics

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

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

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

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

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

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

●Notes

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

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

●Course Purpose

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

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

●Prerequisite Subjects

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

●Course Topics

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

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

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

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

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

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

●Notes

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

Advanced Lecture on High Pressure Materials Science (2.0credits) (高圧力物質科学特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Physics	
Starts 1	Autumn Semester ,every other year	
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor

●Course Purpose

The aim of this class is to learn the fundamental aspects of high-pressure science and the principle of the high-pressure generation apparatus.

●Prerequisite Subjects

Crystal chemistry, crystal physics, solid state physics, inorganic chemistry, material mechanics, phase transformation theory, heat transfer, crystal growth

●Course Topics

1. Basics of high-pressure material science2. Static pressure generation method3. Dynamic pressure generation method4. Equation of state5. The high-pressure in-situ measurement technique6. High pressure and high-temperature generation technique7. Physics under high pressure8. Synthesis of new materials under high pressure9. Latest topics on high-pressure material scienceReview the content of lecture after class.

●Textbook

The textbook will be not used. The latest topics will be introduced in class.

●Additional Reading

●Grade Assessment

Oral presentation and report

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Spintronic Materials and Device Engineering (2.0credits) (スピン物性工学特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Physics	
Starts 1	Autumn Semester ,every other year	
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor

●Course Purpose
The purpose of this lecture is learning fundamental of thin films growth and their crystal growth mechanism toward fabrication of nanodevices including magnetic, semiconducting and optical devices.

●Prerequisite Subjects
Quantum mechanics, Solid State physics

●Course Topics
Film growth; introduction Vapor deposition method Microfabrication and evaluation of filmsCrystal growth; introductionEpitaxial growthRecent application of magnetic thin films

●Textbook
Not specified and lecture notes will be provided.

●Additional Reading
Reference books will be introduced during the course.

●Grade Assessment
Evaluate the level of understanding by reports and attendance to the lecture.

●Notes
There are no specific course requirements.

●Contacting Faculty
During the course.

Advanced Design of Nanostructures in Materials (2.0credits) (材料ナノ構造設計学特論)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Physics
Starts 1	Autumn Semester ,every other year
Lecturer	KatsuyukiMATSUNAGA Professor

●Course Purpose
In order to understand nano-scale structures and stability of materials, students should learn electronic structure theory and its application to crystal defects.

●Prerequisite Subjects
Quantum mechanics, Chemical Physics

●Course Topics
1. Basics of quantum mechanics
2. Band structures of crystals
3. Electronic structures of point defects
4. Grain boundaries
5. Dislocations

Students should review materials before and after lectures.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
Evaluate the level of understanding by reports.

Evaluation standard is understanding and explaining the basic concepts and ideas related to crystal defects with different dimensions.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture. You can also contact the lecturers by email.

Semiconductor Physics and Technology (2.0credits) (半導体物性工学特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Physics	
Starts 1	Spring Semester ,every other year	
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer

●Course Purpose

The purposes of this lecture is undestanding the physics in semiconductor devices and processes. Contents of this lecture are 1. Carrier conduction in semiconductors, 2. Crystalline peorperties and energy band structures of semiconductors, 3. Basics of material science in semiconductor process.

●Prerequisite Subjects

Electromagnetics, thermodynamics, statistical mechanics, solid state physics. Those who did not graduate from an applied physics or materials engineering department are strongly recommended to take course 'Science and Engineering of Crystalline Material

●Course Topics

1. Basic properties of semiconductors
2. Theory of energyband and effective mass in semiconductors
3. Defects and impurities in crystals
4. Semiconductor hetero-structures and crystal growth
5. Strain and carrier mobility
6. Impurity and phonon
7Basics of semiconductor process
8Oxidation and impurity diffusion
9. Solid-phase reaction at interface

Read related section in reference prints before each lecture. Solve example problems in reference prints by yourself after lecture.

●Textbook

Reference prints are distributed. The text book is not used.

●Additional Reading

"Semiconductor Devices - Physics and Technology 2nd edition" S.M. Sze (WILEY), "Electronic Properties of Crystalline Solids" R. Bube (Academic Press), etc... Other reference books will be specified with progress of the lecture.

●Grade Assessment

1. The degree of achievement is comprehensively evaluated by some reports and oral Q&A.
2. When basic problems can be dealt with accurately for
physical properties of semiconductor devices and physical phenomena related to semiconductor processes, it is judged acceptable. If more difficult problems can be solved, it is reflected in the evaluations according to the level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Contact: Osamu Nakatsuka (ext. 5963, nakatsuka@nagoya-u.jp), Masashi Kurosawa (ext. 3817, kurosawa@nagoya-u.jp)
The question on the overtime is accepted in the lecture room and the teacher's room after making an appointment for time by telephone or e-mail.

Electronic Properties of Materials (2.0credits) (電子物性学特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Physics	
Starts 1	Spring Semester ,every other year	
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor

●Course Purpose

In a solid, electrons are interacting with other electrons and phonons. Hence, it is unavoidable to deal with a many-body problem to understand the physical properties of a material. In the first part of this course, basic concepts and principles of the many-body problem in quantum physics will be introduced. We will then discuss the BCS theory of superconductivity to develop practical skills of applying the basic knowledge to an actual problem, as it is a very good example for a many-body problem. In the second part of this course, the superconductivity phenomenon will be treated from a phenomenological point of view, and several superconducting materials will be discussed including the processing techniques and applications. After completion of this course, the students are expected to1. understand the basic of the many-body quantum physics such as second quantization,2. acquire basic understanding of the BCS theory of superconductors and can solve simple problems related to fundamental quantities,3. can discuss the properties of a superconductor based on phenomenological theories,4. gain knowledges about the properties of various superconducting materials.

●Prerequisite Subjects

Solid State Physics, Quantum Mechanics, Thermodynamics, Statistical Mechanics, Electromagnetics

●Course Topics

1. Many-Body Problem in Quantum Mechanics 2. Hartree-Fock Approximation 3. Creation and Annihilation Operators 4. Second Quantization 5. Electron-Phonon Interaction 6. Cooper's Problem 7. BCS Wave Function and Hamiltonian 8. Gap Equation 9. Comparison with Experiments 10. London's Phenomenological Theory 11. Ginzburg-Landau Equation 12. Type-1 and Type-2 Superconductors 13. Pinning and Magnetization Curve 14. Practical Materials (1) 15. Practical Materials (2)The students should go over the contents after each class. Sometimes assignments will be given, that should be solved and submitted.

●Textbook

Not specified, but the reference books shown below will be referred to when necessary.

●Additional Reading

“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)

●Grade Assessment

Grading will be based on the level of achievement evaluated by practices during the course (50%) and term-end report (50%). Students have to demonstrate the capacity to deal with at least simple problems about many-body quantum physics, BCS theory, and the phenomenological theory of superconductors to pass the course.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".Classes can be taken face-to-face or remotely (on-demand).Details about the on-demand lecture materials will be announced through NUCT.Questions can be directed to the instructor face-to-face or via the "Message" function of NUCT.The NUCT function "Message" can also be used for discussion among the students.

●Contacting Faculty

In the classroom after the lecture, at the office upon reservation, or via the "Message" function of NUCT.mail: ikuta_at_mp.pse.nagoya-u.ac.jp (change "_at_" to "@")

Advanced Lectures on Computational Physics (2.0credits) (フロンティア計算物理特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Physics	
Starts 1	Spring Semester ,every other year	
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor

●Course Purpose

Aim of the lecture: To master how to design of functional materials and functional devices based on computational physics. This lecture also aims to acquire the knowledge that computation physics covers many scientific and technological fields from fundamental physics to mass production of electronic devices.Attainment target: The students acquire the ability to apply the knowledge of computational physics learned in this lecture to actual research and development.

●Prerequisite Subjects

Quantum Mechanics, Thermodynamics, Statistical Mechanics, Electromagnetics, Physics of Fluids

●Course Topics

1. Basic of Band Structure Calculations, (1) Tight binding approximation, (2) Effective mass approximation, (3) Density Functional Theory 2. Application to Material Design, (1)Carbon Nanotube, (2) Silicene, (3) Polysilane 3. Application to Device Design, (1) Thermal Oxidation, (2) High-k dielectrics (3) Power devices, (4) Memory devices 4. Application to Biophysics includeing astrobiology5. Fluid Dyanmics

●Textbook

Prints are provided.

●Additional Reading

Suggetsions are given at lectures.

●Grade Assessment

Evaluated with the weights examination (30%) and report (70%). Record more than or equal to 60/100 is qualified.

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Advanced lecture of high-energy elecron spectroscopy (2.0credits) (高エネルギー電子分光特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Physics	
Starts 1	Autumn Semester ,every other year	
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer

●Course Purpose

Learning the fundamentals of electron spectroscopy using high energy electron beam.In particular, we mention advanced measuremnt and mapping techniques using current scanning transmission electron microscopy.

●Prerequisite Subjects

All the lectures related to physics and mathematics in the undergraduate course.

●Course Topics

1.Interaction between solids and electrons:2.Various electron spectroscopic methods:3.Fermi's golden rule:4.Electron energy-loss spectroscopy:5.X-ray fluolescent spectroscopy:6.Statistical data analysis and mapping techniques

●Textbook

R.F. Egerton, Electron Energy-Loss Spectroscopy in the Electron Microscope, Plenum

●Additional Reading

J.M. Cowley, Diffraction Physics, North-Holland

●Grade Assessment

Attendance more than 60% is required.

●Notes

●Contacting Faculty

Applicants can ask questions after each lecture time or anytime by e-mail.

Advanced Lectures on Quantum Beam Materials Science and Engineering (2.0credits) (量子ビーム物性工学特論

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Physics
Starts 1	Autumn Semester ,every other year
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

The objective of this lecture is to learn the interaction between X-rays and substances and the basics of various X-ray analyzes based on this. We will also learn about synchrotron radiation and X-ray free electron lasers, which have become important in recent X-ray analysis.
Achievement goal: Understand and explain the interaction between X-rays and substances and the basics of X-ray analysis.

●Prerequisite Subjects

Optics, Electromagnetism, Quantum Mechanics, Material Physics, Surface Physics

●Course Topics

1, X-ray generation principle
2, Synchrotron radiation
3, Interaction between light and matter
4, X-ray emission spectroscopy
5, X-ray absorption spectroscopy
6, X-ray photoelectron spectroscopy
7, X-ray structure analysis
8, X-ray imaging
9, X-ray microscopy
10, Next-generation X-ray light source (X-ray free electron laser, ultra-low emittance synchrotron radiation source)

●Textbook

Lecture notes will be given.

●Additional Reading

Elements of modern X-ray physics, Jens Als-Nielsen, Des McMorrow

●Grade Assessment

Report

●Notes

●Contacting Faculty

On lecture

Advanced Lectures on Physics of Rheology (2.0credits) (レオロジー物理工学特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Materials Physics	
Starts 1	Spring Semester ,every other year	
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor

●Course Purpose

The purpose of this course is to deepen the understanding of the basic concepts in rheology and the dynamics of soft matter in order to acquire the necessary concepts and solutions to evaluate the dynamics of soft matter by rheology. The goal of this course is to provide students with sufficient knowledge to analyze the rheology of soft matter at the end of the course.

●Prerequisite Subjects

Thermodynamics, statistical physics, soft-matter physics, polymer chemical physics

●Course Topics

1. What is rheology?2. Quantities of rheology3. Rheological Classification of Materials4. Various interesting rheological behaviors5. Viscoelasticity and related quantities6. Viscoelastic analysis7. Various Viscoelastic Measurements8. Plasticity Analysis9. Rheology of Dispersion Systems10. Rheology of polymersThe details will be changed flexibly according to the students' responses and interests. Students will be asked to think about the rheology of related materials after each class.

●Textbook

The lecture is given in such a way that the notes on the blackboard can be used as a textbook. Each of the books listed in the reference section complements the content of the lecture.

●Additional Reading

M. Doi, "Soft-Matter Physics", Oxford University Press, 2013M. Doi and S. F. Edwards, "The Theory of Polymer Dynamics", Oxford University Press, 1990R. Larson, "The Structure and Rheology of Complex Fluids", Oxford University Press, 1998 J. D. Ferry, "Viscoelastic Properties of Polymers", Wiley, 1980

●Grade Assessment

Participants will be requested to submit reports on problems from related topics at the end of the course.

●Notes

There are no specific course requirements. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

Come to Prof. Masubuchi (http://masubuchi.jp). In addition, questions about the class will be accepted through the NUCT function "Message" as described above.

Large-scale Parallel Computing (2.0credits) (大規模並列数値計算特論)

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Lecture	
Course Name	Applied Physics	Materials Physics
Starts 1	1 Spring Semester	1 Spring Semester
Lecturer	Takahiro KATAGIRI Professor	Satoshi OSHIMA Associate Professor

●Course Purpose

Learning how to use a high speed parallel computer. You will have programming practices using the Supercomputer "Flow" at Nagoya university. The programming languages are Fortran and C.

Target:

1. Understanding the state of the art of high speed parallel computer and parallel programming.
2. Acquiring fundamental skills of parallel programming.

●Prerequisite Subjects

Not specified, but taking some courses for programming is recommended.

●Course Topics

[1] High performance computing and its history
[2] Classification of concepts of high speed parallel computers and their state of the art
[3] Usage of high speed parallel computers
[4] Vector operations, multithreading and parallel processing
[5] Fundamentals of OpenMP
[6] Parallelization of Matrix-Vector Products
[7] Parallelization of Power iteration
[8] Parallelization of Matrix-Matrix Products (1)
[9] Parallelization of Matrix-Matrix Products (2)
[10] Use of Numerical Libraries.
[11] GPU Computing / Machine Learning (1)
[12] GPU Computing / Machine Learning (2)
[13] GPU Computing / Machine Learning (3)
[14] GPU Computing / Machine Learning (4)

Students are required to submit reports for several topics. Reports should be submitted before deadlines for each topics. Students should prepare for the class beforehand.

●Textbook

Documents for lectures will be provided.

●Additional Reading

"Supakon wo shiru: Sono kiso kara saishin no doukou made", T. Iwashita, T. Katagiri, and D. Takahashi (in Japanese).
"Supakon purogramming nyuumon -heiretsu shori to MPI no gakusyuu-", T. Katagiri (in Japanese).
"Heiretsu programming nyuumon: Sample program de manabu OpenMP to OpenACC", T. Katagiri (in Japanese).
"Keisan kagaku no tame no heiretsu keisan -daikibo keisan heno daiippo-", Y. Kaneda, A. Sasai, K. Ishii (in Japanese).

●Grade Assessment

Evaluated by scores of reports. The weights for each targets of this course are the same.
The skills to explain the state of the art of high speed parallel computer and parallel programming, and to implement parallel programs, are evaluated by reports.

●Notes

There are no prerequisites.

●Contacting Faculty

Question time: after each lecture

General questions:
Ph.D, Takahiro Katagiri
Information Technology Center, Nagoya University
http://www.abc-lib.org/MyHTML/index.html
052-789-4382
e-mail address: katagiri@cc.nagoya-u.ac.jp

Selected Topics on Materials Science A (1.0credits) (物質科学特別講義A)

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

●Course Purpose

This is an intesive course that introduces recent topics of materials science, aiming to help students acquire the latest information and new knowledge.

●Prerequisite Subjects

●Course Topics

Study from the basic to the newest results of leading-edge research in materials science.

●Textbook

●Additional Reading

●Grade Assessment

Examination or report

●Notes

Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message"

●Contacting Faculty

In addition to the lectures, questions about the class will be accepted through the NUCT function "Message" as described above. The instructor will be announced later by NUCT.

Selected Topics on Materials Science B (1.0credits) (物質科学特別講義B)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Physics
Starts 1	1 Autumn Semester
Lecturer	Part-time Faculty

●Course Purpose

This is an intesive course that introduces recent topics of materials science, aiming to help students acquire the latest information and new knowledge.

●Prerequisite Subjects

●Course Topics

Study from the basic to the newest results of leading-edge research in materials science.

●Textbook

●Additional Reading

●Grade Assessment

Examination or report

●Notes

Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

In addition to the lectures, questions about the class will be accepted through the NUCT function "Message" as described above. The instructor will be announced later by NUCT.

Selected Topics on Materials Science C (1.0credits) (物質科学特別講義C)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Physics
Starts 1	2 Spring Semester
Lecturer	Part-time Faculty

●Course Purpose

This is an intesive course that introduces recent topics of materials science, aiming to help students acquire the latest information and new knowledge.

●Prerequisite Subjects

●Course Topics

Study from the basic to the newest results of leading-edge research in materials science.

●Textbook

●Additional Reading

●Grade Assessment

Examination or report

●Notes

Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

In addition to the lectures, questions about the class will be accepted through the NUCT function "Message" as described above. The instructor will be announced later by NUCT.

Selected Topics on Materials Science D (1.0credits) (物質科学特別講義D)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Materials Physics
Starts 1	2 Autumn Semester
Lecturer	Part-time Faculty

●Course Purpose

This is an intesive course that introduces recent topics of materials science, aiming to help students acquire the latest information and new knowledge.

●Prerequisite Subjects

●Course Topics

Study from the basic to the newest results of leading-edge research in materials science.

●Textbook

●Additional Reading

●Grade Assessment

Examination or report

●Notes

Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

In addition to the lectures, questions about the class will be accepted through the NUCT function "Message" as described above. The instructor will be announced later by NUCT.

mental Research and Exercises on High pressure materials science A (2.0credits) (高圧力物質科学特別実験及び

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose
Experiments and practice of high pressure materials science

●Prerequisite Subjects
High pressure materials science

●Course Topics
Experiments and practice of high pressure materials science.Prepare the contents of experiments and exercises before class.

●Textbook
Will be introduced in the class.

●Additional Reading
Will be introduced in the class.

●Grade Assessment
Oral examination and report

●Notes
Announcements may be delivered via NUCT.

●Contacting Faculty
Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

mental Research and Exercises on High pressure materials science B (2.0credits) (高圧力物質科学特別実験及び

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose
Experiments and pracrice of high pressure materials science

●Prerequisite Subjects
High pressure materials science

●Course Topics
High pressure experiment and analysisMake a plan for master thesis based on the present results.Prepare the contents of experiments and exercises before class.

●Textbook
Will be introduced in the class.

●Additional Reading
Will be introduced in the class.

●Grade Assessment
Oral examination and report

●Notes
Announcements may be delivered via NUCT.

●Contacting Faculty
Questions are welcome within or after each lecture or via NUCT.Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Experimental Research and Exercises on Spintronic Engineering A (2.0credits) (スピン物性工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the sample preparation methods, such as artificial magnetic superlattices, ultra thin films, multilayers prepared by controlling the numbers of atomic layers, and magnetic nano particles and also to learn the lithography methods, Final goal:1) To prepare epitaxial thin films, 2) To prepare artificial magnetic and ultra thin films, 3) To use the lithography methods and 4) To utilize various evaluation methods.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Physical properties of materials, Materials physics, Magnetic materials.

●Course Topics

1. Epitaxial growth of thin films, 2. Preparation for ultra thin films, artificial superlattice, and layered structures, 3. Fabrication of junction devices by lithographic method, 4. Surface and interface characterization of of layered structures, 5. Evaluation of magnetic and electrical properties

●Textbook

Reference papers will be selected.

●Additional Reading

Reference books will be specified.

●Grade Assessment

Evaluation is made by reports.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Experimental Research and Exercises on Spintronic Engineering B (2.0credits) (スピン物性工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn measurement and analysis methods for physical and magnetic properties of thin and nano structured specimens.:Final goal::1) To measure the physical properties of thin and nano structured samples. :2) To measure the magnetic properties of thin and nano structured samples.: 3) To evaluate and analyze the measurement results

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Physical properties of materials, Materials physics, Magnetic materials.

●Course Topics

1. X-ray diffraction for thin films.:2. Measurements and analyses for magnetic : properties of nano structured specimens.:3. Moessbauer Effect.:4. Measurements and analyses of magnetoresistance effect.

●Textbook

Reference papers will be selected.

●Additional Reading

Reference books will be specified.

●Grade Assessment

Evaluation is made by reports.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

mental Research and Exercises on Materials Nanoscience and Design A (2.0credits) (材料設計工学特別実験及び

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Physics	
Starts 1	1 Spring Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
Students should do experiments and exercises related to materials design, and can understand basics of materials science and design.

●Prerequisite Subjects
All lectures and seminars in Physical Science and Engineering.

●Course Topics
Experiments, presentation and discussion on topics for the master course.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
Presentation, Literature investigation and Discussion are evaluated.

Evaluation standard is understanding and explaining the basic concepts and ideas related to the topics for the master course.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

mental Research and Exercises on Materials Nanoscience and Design B (2.0credits) (材料設計工学特別実験及び

Course Type	Specialized Courses	
Division at course	Master's Course	
Class Format	Experiment and Exercise	
Course Name	Materials Physics	
Starts 1	1 Autumn Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
Students should do experiments and exercises related to materials design, and can understand basics of materials science and design.

●Prerequisite Subjects
All lectures and seminars in Physical Science and Engineering.

●Course Topics
Experiments, presentation and discussion on topics for the master course.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
Presentation, Literature investigation and Discussion are evaluated.

Evaluation standard is understanding and explaining the basic concepts and ideas related to the topics for the master course.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

rimental Research and Exercises on Solid-State Device Science A (2.0credits) (結晶デバイス工学特別実験及び演

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

To acquire basic techniques necessary for developing a semiconductor device of novel nanoscale structure and next generation process technology by deepening an understanding of basic matters concerning electron transport in semiconductor devices of nanoscale structure and various phenomena appearing on semiconductor surface and interface and applying and developing the obtained results.
Achievement goal
1. Analyzing and examining data from the experiment
2. Building up further creative research based on comprehensive analysis

●Prerequisite Subjects

Solid-state physics, Physical measurement engineering, Electromagnetism, Electronics

●Course Topics

1. Electron Transport Phenomena in Nano-Scale Devices
2. Surface Reaction in Thin Film Growth
3. Crystalline Structure and Electrical Properties in Hetero-Interface
4. Surface Structure and Electronic State of Semiconductor
5. Control of Surface Reaction and thi film growth
6. Micro/nano-processing of semiconductor crystal and device fabrication
7. Atomic-scale analyses of semiconductor surface electronic states

Engage in appropriate literature research, reading and organizing before and after experiments and exercises. After the experiment, the data should be analyzed and discussed in advance for the research discussion.

●Textbook

Text books will be specified with progress.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

1. Evaluating through explanation and Q&A properly during research discussions. A wide range of studies should be undertaken, including the collection and understanding of relevant research references and preparing appropriate data analysis and explanatory material.
2. When they continue to practice, conduct appropriate experiments, data analysis, observations, explanations, and discussions for their objectives, it is judged pass. When they can actively tackle difficult issues and conduct better discussions and Q&A, they will reflect the results according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Accepted at any time.

rimental Research and Exercises on Solid-State Device Science B (2.0credits) (結晶デバイス工学特別実験及び演

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

To acquire basic techniques necessary for developing a semiconductor device of novel nanoscale structure and next generation process technology by deepening an understanding of basic matters concerning electron transport in semiconductor devices of nanoscale structure and various phenomena appearing on semiconductor surface and interface and applying and developing the obtained results.
Achievement goal
1. Analyzing and examining data from the experiment
2. Building up further creative research based on comprehensive analysis

●Prerequisite Subjects

Solid-state physics, Physical measurement engineering, Electromagnetism, Electronics

●Course Topics

1. Electron Transport Phenomena in Nano-Scale Devices
2. Surface Reaction in Thin Film Growth
3. Crystalline Structure and Electrical Properties in Hetero-Interface
4. Surface Structure and Electronic State of Semiconductor
5. Control of Surface Reaction and thi film growth
6. Micro/nano-processing of semiconductor crystal and device fabrication
7. Atomic-scale analyses of semiconductor surface electronic states

Engage in appropriate literature research, reading and organizing before and after experiments and exercises. After the experiment, the data should be analyzed and discussed in advance for the research discussion.

●Textbook

Text books will be specified with progress.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

1. Evaluating through explanation and Q&A properly during research discussions. A wide range of studies should be undertaken, including the collection and understanding of relevant research references and preparing appropriate data analysis and explanatory material.
2. When they continue to practice, conduct appropriate experiments, data analysis, observations, explanations, and discussions for their objectives, it is judged pass. When they can actively tackle difficult issues and conduct better discussions and Q&A, they will reflect the results according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Accepted at any time.

Experimental Research and Exercises on Material Physics A (2.0credits) (電子物性工学特別実験及び演習A)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

By engaging in cutting-edge research studies, this course aims to ground the basis needed for carrying out experimental studies on the mechanism of various electronic properties of functional materials and to acquire the ability of applying basic knowledges to the development of practical applications.

After completion of this course, the students are expected to acquire various experimental techniquesThey also should gain an overall ability of carrying out fundamental research and developing new functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Solid state physics

●Course Topics

Experimental study on the physical properties, such as electronic transport, magnetism, thermal properties, of novel functional materials, such as superconductors, magnetic materials, topological materials. The course consists of the following contents.

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

After the lecture, students should analyze their data and investigate related literatures.

●Textbook

Papers on related subjects selected from the literatures.

●Additional Reading

Instruct as needed.

●Grade Assessment

Evaluation will be based on the student's performance and participation. To pass, the students have to demonstrate that they have the capacity to adequately analyze the data and have acquired the basic knowledge to interpret the results. The grades will be evaluated according to their level of understanding, achievement, and contribution to the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

Classes will be held face-to-face.

●Contacting Faculty

During the course or at the office upon reservation.

Contact address:

Hiroshi Ikuta, ikuta_at_mp.pse.nagoya-u.ac.jp

Experimental Research and Exercises on Material Physics B (2.0credits) (電子物性工学特別実験及び演習B)

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

By engaging in cutting-edge research studies, this course aims to ground the basis needed for carrying out experimental studies on the mechanism of various electronic properties of functional materials and to acquire the ability of applying basic knowledges to the development of practical applications.

After completion of this course, the students are expected to acquire various experimental techniquesThey also should gain an overall ability of carrying out fundamental research and developing new functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Solid state physics

●Course Topics

Experimental study on the physical properties, such as electronic transport, magnetism, thermal properties, of novel functional materials, such as superconductors, magnetic materials, topological materials. The course consists of the following contents.

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

After the lecture, students should analyze their data and investigate related literatures.

●Textbook

Papers on related subjects selected from the literatures.

●Additional Reading

Instruct as needed.

●Grade Assessment

Evaluation will be based on the student's performance and participation. To pass, the students have to demonstrate that they have the capacity to adequately analyze the data and have acquired the basic knowledge to interpret the results. The grades will be evaluated according to their level of understanding, achievement, and contribution to the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

●Contacting Faculty

During the course or at the office upon resevation.

tal Research and Exercises on Frontiers for Computational Physics A (2.0credits) (フロンティア計算物理特別実

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: Through reading original papers related to computational physics, students are encouraged to master how to advance his/her own research, as well as to learn recent developments in the field.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Frontiers for Computational Physics

●Course Topics

Exercises and numerical experiments on reaserch topics about frontier for computational physics

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

tal Research and Exercises on Frontiers for Computational Physics B (2.0credits) (フロンティア計算物理特別実

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: Through reading original papers related to computational physics, students are encouraged to master how to advance his/her own research, as well as to learn recent developments in the field.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Frontiers for Computational Physics, Experimental Research and Exercises on Frontiers for Computational Physics

●Course Topics

Advanced exercises and numerical experiments on reaserch topics about for computational physics

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

h and Exercises on Materials science by electron nano-scopic spectroscopy A (2.0credits) (ナノ顕微分光物質科学

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

Students can learn the experimental techniques and data analysis procedures on their own research subjects, through which they can develop their creativity and application skills.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

ch and Exercises on Materials science by electron nano-scopic spectroscopy B (2.0credits) (ナノ顕微分光物質科

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

Students can learn the advanced experimental techniques and data analysis procedures on their own research subjects, through which they can develop their creativity and application skills.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. Carter:Transmission Electron Microscopy, Part 1: Basics2nd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

earch and Exercises on Quantum Beam Materials Science and Enginnering A (2.0credits) (量子ビーム物性工学特

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Experiment and Exercise
Course Name	Materials Physics
Starts 1	1 Spring Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To deepen the understanding of the basic methods necessary to carry out various experiments using X-ray beams, and to acquire the techniques.Achievement goal: To understand and explain the basics of various experimental methods using X-ray beams, and to be able to perform experiments using X-ray beams.

●Prerequisite Subjects

not specified

●Course Topics

1. Experiment with X-ray mirrors2. Experiments with X-ray nanobeams3. Nano X-ray analysis4. X-ray microscope

●Textbook

It will be given according to the experiment.

●Additional Reading

It will be given according to the experiment.

●Grade Assessment

Report, Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

at experiment

earch and Exercises on Quantum Beam Materials Science and Enginnering B (2.0credits) (量子ビーム物性工学特

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Experiment and Exercise
Course Name	Materials Physics
Starts 1	1 Autumn Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To deepen the understanding of the basic methods necessary to carry out various experiments using X-ray beams, and to acquire the techniques.Achievement goal: To understand and explain the basics of various experimental methods using X-ray beams, and to be able to perform experiments using X-ray beams.

●Prerequisite Subjects

not specified

●Course Topics

1. Experiment with X-ray mirrors2. Experiments with X-ray nanobeams3. Nano X-ray analysis4. X-ray microscope

●Textbook

It will be given according to the experimant.

●Additional Reading

It will be given according to the experimant.

●Grade Assessment

Report, Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

at experiment

perimental Research and Exercises on Physics of Rheology A (2.0credits) (レオロジー物理工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose

The essential of rheology physics will be conveyed through the research projects that will be assigned to each participant.Objective: To acquire the ability to carry out experimental/computational/theoretical studies related to rheological physics and engineering and to conduct research.

●Prerequisite Subjects

Lecture course on rheological physics and seminars on rheological physics.

●Course Topics

Research projects will be made by the participants on rheology physics by means of experimental, theoretical and simulation approaches. The results will be reported in the seminar courses, as well as the conferences and the meetings outside, and will be summarized as the thesis.

●Textbook

Will be introduced in the class.

●Additional Reading

Any books on rheology and softmatter physics

●Grade Assessment

The progress of the project will be periodically observed.

●Notes

To be able to do research in the Rheology Physics Group.

●Contacting Faculty

Come to Prof. Masubuchi (http://masubuchi.jp)

perimental Research and Exercises on Physics of Rheology B (2.0credits) (レオロジー物理工学特別実験及び演習

Course Type	Specialized Courses		
Division at course	Master's Course		
Class Format	Experiment and Exercise		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose

The essential of rheology physics will be conveyed through the research projects that will be assigned to each participant.Objective: To acquire the ability to carry out experimental/computational/theoretical studies related to rheological physics and engineering and to conduct research.

●Prerequisite Subjects

Lecture course on rheological physics and seminars on rheological physics.

●Course Topics

Continuing from the course A, the research projects will be made by the participants on rheology physics by means of experimental, theoretical and simulation approaches. The results will be reported in the seminar courses, as well as the conferences and the meetings outside, and will be summarized as the thesis.

●Textbook

Will be introduced in the class.

●Additional Reading

Any books on rheology and softmatter physics

●Grade Assessment

The progress of the project will be periodically observed.

●Notes

To be able to do research in the Rheology Physics Group.

●Contacting Faculty

Come to Prof. Masubuchi (http://masubuchi.jp)

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.

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

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.

●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

To research in advanced engineering, it is necessary to learn the latest research trends through practice. The purpose of this experiment is to find the research issues on one's own and conduct research experiments using the latest experimental equipment and molecular simulation technology.
Through this experiment, you will be able to understand the principles of the Raman spectrometer, ionization potential measurement, X-ray diffraction etc. and molecular simulation software and learn how to use them practically. The goal is to comprehensively acquire the knowledge, skills, and presentation techniques related to advanced experiments necessary for conducting the research that was the subject.

●Prerequisite Subjects

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

●Course Topics

When students choose the prepared subject, students perform the curriculum using one of a Raman spectrometer, an ionization potential measurement and an X-ray diffractometer and learn the principles and practical and advanced usage of these equipment. In the case of an experiment proposed by students (original experiment), students proposes a molecular simulation experiment or research using the above-described equipment, and conduct the experiment with the instructor to produce results. Ultimately, students discuss the results, present their results, and learn how to use the advanced equipment and simulation skills.

●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

No course requirements.

●Contacting Faculty

Arranging the schedules by e-mail and etc.

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

Handouts 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.

●Contacting Faculty

Questions will be answered before class, in class, after class or by e-mail.

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

Mainly accepted during each lecture. Other general questions are accepted by Professor Yukio Ishida.
<Contact> TEL: 052-747-6797, Email: ishida@nuem.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 is a course to acquire basic skills to summarize research as a paper in English. By the end of the course, students will be able to …
explain the basic structure of science and technology research paper
list essential components of each section of research paper
type short multiple-paragraph essays with appropriate punctuation
orally express logically structured opinion

●Prerequisite Subjects

Various subjects relating to English

●Course Topics

1. Basics of academic writing in English (1)
2. Basic structure of science & technology research paper (1)
3. Writing (1), feedback and opinion exchange
4. Basics of academic writing in English (2)
5. Basic structure of science & technology research paper (2)
6. Writing (2), feedback and opinion exchange
7. Basic structure of science & technology research paper (3)
8. Writing (3), feedback and opinion exchange

Students are expected to spend a few hours each week reviewing key points of the lecture and working on the writing assignment.

●Textbook

None. Students will receive handouts in each class session.

●Additional Reading

Glasman-Deal, H. (2010). Science Research Writing For Non-Native Speakers of English. Imperial College Press.
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

Submitting three short writing assignments that show understanding of research paper structure with appropriate punctuation is required for a passing grade. Speaking English contributing to discussion and opinion exchange, as well as raising questions in class, is strongly encouraged.

●Notes

There are no prerequisites.

●Contacting Faculty

Email address to be announced in the first class

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

●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.

●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.

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

●Grade Assessment

●Notes

●Contacting Faculty

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 researcher
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.

●Contacting Faculty

After each class student can ask in person.
Otherwise, contact to:

Prof. Kishida kishida@nagoya-u.jp

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 Physics
Starts 1	1 Spring and Autumn Semester
Lecturer	Associated Faculty

●Course Purpose
The aim of this course is to experience practicing the knowledge of fundamental engineering in real society by conducting practical training for a certain period at private companies, research institutes, etc. outside the university. Students are expected to learn the relationship between engineering and the society in an environment different from university, and to reaffirm the importance of basic study. The students will be able to:
1. explain how the fundamental knowledge of engineering is related to applications outside the university.
2. explain how the engineering is utilized in the training place.

●Prerequisite Subjects
Basic subjects in engineering and the student's major field. The required background strongly depends on the training place, and thus specific subject names are not shown here.

●Course Topics
Appropriate issues that will be determined by consulting with the mentor of the training place and the trainee. The following issues are examples.
1. Background of research in the training place and investigation for research topics.
2. Experiments or calculations for specific research topics.
3. Summary of research results and reporting.

Students should carefully listen instructions by the mentor. Students should review their investigation and research after this class, and submit reports.

●Textbook
Not specified, because the required textbooks depend on the training place and the research topic. Students will be required to use textbooks used for some related courses.

●Additional Reading
Not specified, because the required textbooks depend on the training place and the research topic.

●Grade Assessment
Report and oral presentation. The score will be given according to the understanding of such as the relation between the fundamental knowledge of engineering and researches in the training place, and how engineering is utilized outside the university. Students will pass if they score 60 or more of 100 full marks.

●Notes
Note that there may be an announcement via NUCT.

●Contacting Faculty
The supervisor will answer.

Internship B (1.0credits) (学外実習Ｂ)

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

●Course Purpose

The aim of this course is to experience practicing the knowledge of fundamental engineering in real society by conducting practical training for a certain period at private companies, research institutes, etc. outside the university. Students are expected to learn the relationship between engineering and the society in an environment different from university, and to reaffirm the importance of basic study. The students will be able to:
1. explain how the fundamental knowledge of engineering is related to applications outside the university.
2. explain how the engineering is utilized in the training place.

●Prerequisite Subjects

Basic subjects in engineering and the student's major field. The required background strongly depends on the training place, and thus specific subject names are not shown here.

●Course Topics

Appropriate issues that will be determined by consulting with the mentor of the training place and the trainee. The following issues are examples.
1. Background of research in the training place and investigation for research topics.
2. Experiments or calculations for specific research topics.
3. Summary of research results and reporting.

Students should carefully listen instructions by the mentor. Students should review their investigation and research after this class, and submit reports.

●Textbook

Not specified, because the required textbooks depend on the training place and the research topic. Students will be required to use textbooks used for some related courses.

●Additional Reading

Not specified, because the required textbooks depend on the training place and the research topic.

●Grade Assessment

Report and oral presentation. The score will be given according to the understanding of such as the relation between the fundamental knowledge of engineering and researches in the training place, and how engineering is utilized outside the university. Students will pass if they score 60 or more of 100 full marks.

●Notes

Note that there may be an announcement via NUCT.

●Contacting Faculty

The supervisor will answer.

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

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

●Course Purpose

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

●Prerequisite Subjects

Not required

●Course Topics

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

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

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

●Textbook

Materials are provided at classes.

●Additional Reading

Introduced according to the process of the lecture.

●Grade Assessment

Evaluated by reports.

●Notes

Not required.

●Contacting Faculty

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

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

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

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

●Course Purpose

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

●Prerequisite Subjects

Advanced super-interdisciplinary mobility innovation I

●Course Topics

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

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

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

●Textbook

Materials are provided at classes.

●Additional Reading

Introduced according to the process of the lecture.

●Grade Assessment

Evaluated by reports.

●Notes

Not required.

●Contacting Faculty

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

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

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	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
Office hour:Wed.13:0014:00 @Green Vehicle Material Research Building 1F
Mail to: o_shimizu@nuem.nagoya-u.ac.jp

ced Mobility Program Practical Training Course(Autonomous Vehicle) (2.0credits) (先進モビリティ学実習（自動運

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Exercise and 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	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 realization of autonomous drive by using 1/10 model car. Students develop the software system for autonomous driving. The course is organized as follows:

1. Understand architecture of autonomous drive
2. Understand the image processing for lane detection, and its implementation
3. Understand the control technique for lane following and its implementation

●Prerequisite Subjects

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

●Course Topics

This course is aiming to realization of autonomous drive by using 1/10 model car. Students develop the software system for autonomous driving. The course is organized as follows:

1. Architecture of autonomous drive
2. Image processing for lane detection, and its implementation
3. Control technique for lane following and its implementation

Class is performed based on group activity.

●Textbook

Original lecture note will be provided.

●Additional Reading

It will be announced in the class if necessary.

ced Mobility Program Practical Training Course(Autonomous Vehicle) (2.0credits) (先進モビリティ学実習（自動運

●Grade Assessment

Evaluate based on attendance at lecture, total score of tasks set at each time, final presentation. Special certificate will be provided for passed students.

●Notes

There are no prerequisites.

●Contacting Faculty

Office hour:Wed.13:0014:00 @Green Vehicle Material Research Building 1F
Mail to: o_shimizu@nuem.nagoya-u.ac.jp

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

Course Type	Comprehensive engineering courses		
Division at course	Master's Course		
Class Format	Exercise and 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	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 design and analysis of EV formula car. In addition, Test drive is carried out. The course is organized as follows:1. Understand the mechanism of electric vehicle2. Understand the characteristics of motor and battery3. Understand the way of analysis and design of vehicle

●Prerequisite Subjects

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

●Course Topics

This course is aiming to design and analysis of EV formula car. In addition, Test drive is carried out. The course is organized as follows:1. Mechanism of electric vehicle2. Characteristics of motor and battery3. Way of analysis and design of vehicle Class is performed based on group activity.

●Textbook

Original lecture note will be provided.

●Additional Reading

It will be announced in the class if necessary.

●Grade Assessment

Evaluate based on attendance at lecture, total score of tasks set at each time, final presentation. You need more than mark of 60 out of 100 points. Special certificate will be provided for passed students.

●Notes

There are no prerequisites.

●Contacting Faculty

Office hour:Wed.13:0014:00 @Green Vehicle Material Research Building 1FMail to: o_shimizu@nuem.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 High pressure materials science 2A (2.0credits) (高圧力物質科学セミナー2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose
This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit towards the construction of a new field of materials science and engineering, especially materials processing at high pressure.

●Prerequisite Subjects
Crystal physics, Transport phenomena, Material physicochemical, Statistical mechanics A, Inorganic chemistry, Material mechanics, Material physics, Materials process mathematics, Numerical analysis, Solid state physics, Analysis chemistry 2, Material stre

●Course Topics
Students are requested to prepare their own answers to their thesis topics and the up-to-date or prospective topics relevant to the materials processing at high pressure.
Prepare the contents of experiments and exercises before class.

●Textbook
Will be introduced in the class.

●Additional Reading
Will be introduced in the class.

●Grade Assessment
Oral presentation, Question and Answer:

●Notes
Announcements may be delivered via NUCT.

●Contacting Faculty
Questions are welcome within or after each lecture or via NUCT.
Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on High pressure materials science 2B (2.0credits) (高圧力物質科学セミナー2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit towards the construction of a new field of materials science and engineering, especially materials processing at high pressure.

●Prerequisite Subjects

●Course Topics

Students are requested to prepare their own answers to their thesis topics and the up-to-date or prospective topics relevant to the materials processing at high pressure.
Prepare the contents of experiments and exercises before class.

●Textbook

Will be introduced in the class.

●Additional Reading

Will be introduced in the class.

●Grade Assessment

Oral presentation, Question and Answer:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.
Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on High pressure materials science 2C (2.0credits) (高圧力物質科学セミナー2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose
This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit towards the construction of a new field of materials science and engineering, especially materials processing at high pressure.

●Prerequisite Subjects

●Course Topics
Students are requested to prepare their own answers to their thesis topics and the up-to-date or prospective topics relevant to the materials processing at high pressure.
Prepare the contents of experiments and exercises before class.

●Textbook
Will be introduced in the class.

●Additional Reading
Will be introduced in the class.

●Grade Assessment
Oral presentation, Question and Answer:

●Notes
Announcements may be delivered via NUCT.

●Contacting Faculty
Questions are welcome within or after each lecture or via NUCT.
Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on High pressure materials science 2D (2.0credits) (高圧力物質科学セミナー2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit towards the construction of a new field of materials science and engineering, especially materials processing at high pressure.

●Prerequisite Subjects

●Course Topics

Students are requested to prepare their own answers to their thesis topics and the up-to-date or prospective topics relevant to the materials processing at high pressure.
Prepare the contents of experiments and exercises before class.

●Textbook

Will be introduced in the class.

●Additional Reading

Will be introduced in the class.

●Grade Assessment

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.
Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on High pressure materials science 2E (2.0credits) (高圧力物質科学セミナー2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	3 Spring Semester		
Lecturer	Masashi HASEGAWA Professor	Ken NIWA Associate Professor	Takuya SASAKI Assistant Professor

●Course Purpose

This seminar aims at the advanced training for doctoral students to develop their creative mind and also to grow a challenging spirit towards the construction of a new field of materials science and engineering, especially materials processing at high pressure.

●Prerequisite Subjects

Crystal physics, material physical chemistry, statistical mechanics, inorganic chemistry, material mechanics, material physics, analytical chemistry, material strength, Phase transformation engineering, ceramic materials science, optical functional materials science, electronic materials, thin film / crystal growth theory, organic materials science

●Course Topics

Students are requested to prepare their own answers to their thesis topics and the up-to-date or prospective topics relevant to the materials processing at high pressure.
Prepare the contents of experiments and exercises before class.

●Textbook

Will be introduced in the class.

●Additional Reading

Will be introduced in the class.

●Grade Assessment

Oral presentation, Question and Answer:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

Questions are welcome within or after each lecture or via NUCT.
Corresponding instructor: Ken NIWAniwa[at]mp.pse.nagoya-u.ac.jp*[at]->@

Seminar on Spintronic Engineering 2A (2.0credits) (スピン物性工学セミナー2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of spintronic materials in the world.:Final goal::1) To explain the industrial applications of : physical and spintronic properties of materials.:2) To explain a trend of the future : investigation on spintronic materials.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Materials physics, Magnetic materials, Seminar on magnetics 1A to 1D.

●Course Topics

1. Basic theory and experimental methods on : crystal structures, magnetic properties, : electric properties of materials.:2. Basic theory and experimental methods on : thermal, elastic and optical properties of : materials.:3. Preparation of the magnetic thin films and nano-particle. 4. Analysis of crystal structure. 5. Analysis of surface and interface structure. 6. Advanced research subjects on magnetism.

●Textbook

No requirement for taking the course.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Spintronic Engineering 2B (2.0credits) (スピン物性工学セミナー2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of spintronic materials in the world.:Final goal::1) To explain the industrial applications of : physical and spintronic properties of materials.:2) To explain a trend of the future : investigation on spintronic materials.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Materials physics, Magnetic materials, Seminar on magnetics 1A to 1D, Seminar on magnetics 2A

●Course Topics

1. Control methods of magnetic properties of : thin films and nano particles.:2. Application to GMR and TMR junctions to : devices.:3. Application of CMR effect to devices.:4. Moessbauer effect of thin films.:5. Lithography.:6. Application of magnetism to

●Textbook

The reference print is distributed.

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Spintronic Engineering 2C (2.0credits) (スピン物性工学セミナー2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the recent applications of magnetic properties to devices, that is magnetics, from stand points of many fields of engineering, such as applied physics, applied chemistry, electric engineering, machine engineering. To propose new ideas for creative application methods of magnetic properties of materials.:Final goal::1) To explain the recent applications of : magnetism, from stands points of the other : engineering fields.:2) To propose the new theme for applications of : magnetism.:3) To lead the elementary researchers in the : field of magnetics

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Materials physics, Magnetic materials, Seminar on magnetics 1A to 1D, Seminar on magnetics 2A to 2B

●Course Topics

1. Control methods of magnetic properties of : thin films and nano particles.:2. Application to GMR and TMR junctions to : devices.:3. Application of CMR effect to devices.:4. Moessbauer effect of thin films.:5. Lithography:6. Application of magnetism to

●Textbook

The reference print is distributed.

●Additional Reading

Reference books will be specified with progress

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Spintronic Engineering 2D (2.0credits) (スピン物性工学セミナー2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of spintronic materials in the world.:Final goal::1) To explain the industrial applications of : physical and spintronic properties of materials.:2) To explain a trend of the future : investigation on spintronic materials.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Materials physics, Magnetic materials, Seminar on magnetics 1A to 1D, Seminar on magnetics 2A to 2C

●Course Topics

1. Control methods of magnetic properties of : thin films and nano particles.:2. Application to GMR and TMR junctions to : devices.:3. Application of CMR effect to devices.:4. Moessbauer effect of thin films.:5. Lithography:6. Application of magnetism to

●Textbook

●Additional Reading

Reference books will be specified with progress.

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.:

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Spintronic Engineering 2E (2.0credits) (スピン物性工学セミナー2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	3 Spring Semester		
Lecturer	Hidefumi ASANO Professor	Kenji UEDA Associate Professor	Tetsuya HAJIRI Assistant Professor

●Course Purpose

To learn the basic theory on physical properties of materials including magnetism and the recent experimental and analytical methods on the physical properties. To study the trend of investigations and industrial developments of spintronic materials in the world.:Final goal::1) To explain the industrial applications of : physical and spintronic properties of materials.:2) To explain a trend of the future : investigation on spintronic materials.

●Prerequisite Subjects

Electromagnetic theory A, Physics of crystal, Quantum mechanics A, Physical properties of materials, Materials physics, Magnetic materials, Seminar on magnetics 1A to 1D, Seminar on magnetics 2A to 2D

●Course Topics

1. Control methods of magnetic properties of : thin films and nano particles.:2. Application to GMR and TMR junctions to : devices.:3. Application of CMR effect to devices.:4. Moessbauer effect of thin films.:5. Lithography:6. Application of magnetism to

●Textbook

●Additional Reading

●Grade Assessment

Evaluation is made by reports and presentations on the respective research.

●Notes

Announcements may be delivered via NUCT.

●Contacting Faculty

During the course

Seminar on Materials Design and theory 2A (2.0credits) (材料設計工学セミナー2A)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	1 Spring Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
After this seminar, students should understand important items of recent scientific researches related to materials design, and can apply them to propose new materials science theories.

●Prerequisite Subjects
Quantum mechanics, Condensed matter physics, Chemical Physics

●Course Topics
Presentation and discussion on topics for the doctor course.

Students should prepare presentation sildes or resumes for each seminar.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to the topics for the doctor course.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Materials Design and theory 2B (2.0credits) (材料設計工学セミナー2B)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	1 Autumn Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
After this seminar, students should understand important items of recent scientific researches related to materials design, and can apply them to propose new materials science theories.

●Prerequisite Subjects
Quantum mechanics, Condensed matter physics, Chemical Physics

●Course Topics
Presentation and discussion on topics for the doctor course.

Students should prepare presentation sildes or resumes for each seminar.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to the topics for the doctor course.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Materials Design and theory 2C (2.0credits) (材料設計工学セミナー2C)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	2 Spring Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
After this seminar, students should understand important items of recent scientific researches related to materials design, and can apply them to propose new materials science theories.

●Prerequisite Subjects
Quantum mechanics, Condensed matter physics, Chemical Physics

●Course Topics
Presentation and discussion on topics for the doctor course.

Students should prepare presentation sildes or resumes for each seminar.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to the topics for the doctor course.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Materials Design and theory 2D (2.0credits) (材料設計工学セミナー2D)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	2 Autumn Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
After this seminar, students should understand important items of recent scientific researches related to materials design, and can apply them to propose new materials science theories.

●Prerequisite Subjects
Quantum mechanics, Condensed matter physics, Chemical Physics

●Course Topics
Presentation and discussion on topics for the doctor course.

Students should prepare presentation sildes or resumes for each seminar.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to the topics for the doctor course.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Materials Design and theory 2E (2.0credits) (材料設計工学セミナー2E)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Seminar	
Course Name	Materials Physics	
Starts 1	3 Spring Semester	
Lecturer	KatsuyukiMATSUNAGA Professor	Tatsuya YOKOI Assistant Professor

●Course Purpose
After this seminar, students should understand important items of recent scientific researches related to materials design, and can apply them to propose new materials science theories.

●Prerequisite Subjects
Quantum mechanics, Condensed matter physics, Chemical Physics

●Course Topics
Presentation and discussion on topics for the doctor course.

Students should prepare presentation sildes or resumes for each seminar.

●Textbook
There is no specific text book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Additional Reading
There is no specific reference book, but in some cases it may be specified by the lecturer or distributed depending on the content of the lesson.

●Grade Assessment
1. Presentation (40%)
2. Literature investigation (30%)
3. Discussion (40%)

Evaluation standard is understanding and explaining the basic concepts and ideas related to the topics for the doctor course.

●Notes
There are no specific course requirements.

●Contacting Faculty
Questions are welcome during and after each lecture.

Seminar on Solid-State Device Science 2A (2.0credits) (結晶デバイスセミナー2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar consists of lectures and research introductions. The purpose of the seminar is to learn the basics of semiconductor physical properties and solid state physics, which are essentially important for conducting research on semiconductor devices and semiconductor materials. In addition, in the course of research introduction, students introduce their own research and academic papers related to the lectures, and will obtain understanding of the basics and advanced applications of their research fields and broaden their horizons.
Objectives: To obtain a systematic and advanced understanding of the characteristics of semiconductor materials and to obtain the comprehensive and creative knowledge necessary for research and development.

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics and statistical mechanics, Electromagnetism

●Course Topics

1. Properties of Energy Bands
1-1. Energy-Band Calculations
1-2. Density of States in Energy Bands
1-3. Electron Velocity and Electrical Properties
1-4. The Band Model and Electron Properties
1-5. Energy Bands in Real Crystals
1-6. Excitons and polarons
1-7. Bands and bonds
2. Carrier transport
2-1. Wave packets
2-2. The Boltzmann equation and it's solution
2-3. Electrical conductivity in the relaxation-time approximation
2-4. Electrical conductivity in semiconductors and metals
2-5. Thermal conductivity due to electrons
2-6. Thermoelectric effect

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

R. H. Bube, "Electronic Properties of Crystalline Solids", etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make better presentations and Q&A, they

will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Solid-State Device Science 2B (2.0credits) (結晶デバイスセミナー2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar will consist of lectures and reading academic journal papers. The purpose of this seminar is to understand electron transport mechanism in semiconductor devices and various phenomena occurring on semiconductor surfaces and interfaces based on basic physics. In addition, students take up academic journal papers related to research themes, and acquire basic knowledge and advanced applied technologies in their research fields. Also, they acquire systematic knowledge that leads to the comprehensive capabilities required to promote individual research.
Achievement goal
1. Understanding the basic operation and advanced applications of the semiconductor device
2. Understanding the advanced problems in actual semiconductor devices

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics and statistical mechanics, Electromagnetism, Electronics

●Course Topics

1. Ideal MIS Diode
2. Surface Space-Charge Region
3. Ideal MIS Curves
4. Si-SiO2 MOS Diode
5. Interface Trapped Charge
6. Measurement of Interface Trap Density: Capacitance Method
7. Measurement of Interface Trap Density: Conductance Method
8. Equivalent circuits of MOS capacitors
9. Charges in SiO2
10. Influence of workfunction difference
11. Behaviors of carriers in inversion layers
12. Dielectric breakdown
13. Electric conduction mechanisms

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

S. M. Sze, "Physics of Semiconductor Devices", (John Wiley & Sons), etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make better presentations and question and

Q&A appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Solid-State Device Science 2C (2.0credits) (結晶デバイスセミナー2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar consists of lectures and research introductions. The purpose of the seminar is to learn the basics of semiconductor physical properties and solid state physics, which are essentially important for conducting research on semiconductor devices and semiconductor materials. In addition, in the course of research introduction, students introduce their own research and academic papers related to the lectures, and will obtain understanding of the basics and advanced applications of their research fields and broaden their horizons.
Objectives: To obtain a systematic and advanced understanding of the characteristics of semiconductor materials and to obtain the comprehensive and creative knowledge necessary for research and development.

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics and statistical mechanics, Electromagnetism

●Course Topics

1. Properties of Energy Bands
1-1. Energy-Band Calculations
1-2. Density of States in Energy Bands
1-3. Electron Velocity and Electrical Properties
1-4. The Band Model and Electron Properties
1-5. Energy Bands in Real Crystals
1-6. Excitons and polarons
1-7. Bands and bonds
2. Carrier transport
2-1. Wave packets
2-2. The Boltzmann equation and it's solution
2-3. Electrical conductivity in the relaxation-time approximation
2-4. Electrical conductivity in semiconductors and metals
2-5. Thermal conductivity due to electrons
2-6. Thermoelectric effect

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

R. H. Bube, "Electronic Properties of Crystalline Solids", etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make better presentations and Q&A, they

will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Solid-State Device Science 2D (2.0credits) (結晶デバイスセミナー2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar will consist of lectures and reading academic journal papers. The purpose of this seminar is to understand electron transport mechanism in semiconductor devices and various phenomena occurring on semiconductor surfaces and interfaces based on basic physics. In addition, students take up academic journal papers related to research themes, and acquire basic knowledge and advanced applied technologies in their research fields. Also, they acquire systematic knowledge that leads to the comprehensive capabilities required to promote individual research.

Achievement goal

1. Understanding the basic operation and advanced applications of the semiconductor device
2. Understanding the advanced problems in actual semiconductor devices

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics and statistical mechanics, Electromagnetism, Electronics

●Course Topics

1. Ideal MIS Diode
2. Surface Space-Charge Region
3. Ideal MIS Curves
4. Si-SiO2 MOS Diode
5. Interface Trapped Charge
6. Measurement of Interface Trap Density: Capacitance Method
7. Measurement of Interface Trap Density: Conductance Method
8. Equivalent circuits of MOS capacitors
9. Charges in SiO2
10. Influence of workfunction difference
11. Behaviors of carriers in inversion layers
12. Dielectric breakdown
13. Electric conduction mechanisms

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

S. M. Sze, "Physics of Semiconductor Devices", (John Wiley & Sons), etc.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make better presentations and question and

Q&A appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Solid-State Device Science 2E (2.0credits) (結晶デバイスセミナー2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	3 Spring Semester		
Lecturer	Osamu NAKATSUKA Professor	Masashi KUROSAWA Lecturer	Mitsuo SAKASITA Assistant Professor
	SHIBAYAMA Shigehisa Assistant Professor		

●Course Purpose

This seminar will consist of lectures and reading academic journal papers. The purpose of the lectures is to understand the electron transport phenomena in low-dimensional semiconductor devices based on basic physics, students make reading and presentation using textbooks. In addition, students take up academic journal papers related to research themes, understand the basics of the research field and its advanced applications, and obtain systematic knowledge from a broad perspective that leads to the comprehensive capabilities required to promote individual research.
Objective: Understanding the operation of low-dimensional semiconductor devices

●Prerequisite Subjects

Solid-state physics, Quantum mechanics, Thermodynamics and statistical mechanics, Electromagnetism

●Course Topics

1. Wave functions of well, quadratic, and triangular potentials
2. About low-dimensional systems
3. Subband formation
4. Two-dimensional well potential
5. Quantum wells in heterostructures
6. About Tunnel Transitions
7. T-matrix
8. Current and conductivity due to tunneling phenomenon
9. Superlattices and mini-bands
10. Tunnel effect in the heterostructure

Read related section before each seminar. Solve example problems in the text book by yourself after seminar.

●Textbook

Text books will be specified with progress of the seminar.

●Additional Reading

Reference books will be specified with progress of the seminar.

●Grade Assessment

1. The degree of achievement is evaluated through oral presentations and Q&A to presentations. Please try to learn a wide range of things, such as reading references and preparing appropriate resumes.
2. When they attend each seminar and make appropriate presentation and questions for their objectives, it is judged pass. When they can actively tackle difficult issues and make better presentations and question and Q&A appropriately, they will reflect the evaluations according to their level.

●Notes

No requirement for taking the course.

●Contacting Faculty

Dealing during seminar.

Seminar on Materials Physics 2A (2.0credits) (電子物性工学セミナー2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

Classes will be held face-to-face.

●Contacting Faculty

During the seminar or at the office upon reservation.

Contact address:
Hiroshi Ikuta, ikuta_at_mp.pse.nagoya-u.ac.jp

Seminar on Materials Physics 2B (2.0credits) (電子物性工学セミナー2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

●Contacting Faculty

During the seminar or at the office upon reservation.

Seminar on Materials Physics 2C (2.0credits) (電子物性工学セミナー2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

Classes will be held face-to-face.

●Contacting Faculty

During the seminar or at the office upon reservation.

Contact address:
Hiroshi Ikuta, ikuta_at_mp.pse.nagoya-u.ac.jp

Seminar on Materials Physics 2D (2.0credits) (電子物性工学セミナー2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

●Contacting Faculty

During the seminar or at the office upon reservation.

Seminar on Materials Physics 2E (2.0credits) (電子物性工学セミナー2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	3 Spring Semester		
Lecturer	Hiroshi IKUTA Professor	Kazumasa IIDA Associate Professor	TakafumiHATANO Assistant Professor
	Takahiro URATA Assistant Professor		

●Course Purpose

This seminar aims to acquire knowledge on electronic properties of various functional materials, understand the current research trend, and learn various experimental methods by thoroughly reading recent literatures. The knowledge will be deepened by presentation and discussion during the seminar.

After completion of this course, the students are expected to ground the fundamental basis for conducting research on electronic properties of functional materials, strengthen the ability of analyzing and understanding the characteristic properties of functional materials from various viewpoints, and acquire skills required for research and development of practical functional materials.

●Prerequisite Subjects

Quantum mechanics, Thermodynamics, Statistical physics, Electromagnetism, Solid state physics

●Course Topics

1. Electronic properties of solids 2. Electron transport phenomena and magnetism 3. Superconductivity 4. Strongly correlated electron system 5. Magnetic materials 6. Topological materials

The students are required to read the designated paper. If there remain issues that were not solved through the discussion during the lecture, the students should investigate them after the class.

●Textbook

Papers chosen from the recent literatures.

●Additional Reading

“Introduction to the Electron Theory of Metals”, U. Mizutani (Cambridge University Press)
“Introduction to Superconductivity”, M. Tinkham (McGraw-Hill)
Further references will be given if necessary.

●Grade Assessment

Evaluated based on oral presentation (60%) and discussion (40%) during the seminar. Students have to demonstrate basic understanding of the subject dealt in the seminar to pass the course, and will obtain higher grades if they demonstrate a deeper understanding and/or contribute to the seminar by making questions that stimulate the discussion.

●Notes

Undergraduate level knowledge of the subjects listed in "Background Subjects".

Classes will be held face-to-face.

●Contacting Faculty

During the seminar or at the office upon resevation.

Contact address:
Hiroshi Ikuta, ikuta_at_mp.pse.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics2A (2.0credits) (フロンティア計算物理セミナー2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: Through reading original papers related computational physics, students are encouraged to master how to advance his/her own research, as well as to learn recent developments in the field.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics, Seminar on Frontiers for Computational Physics 1ABCD

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, combustion3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics2B (2.0credits) (フロンティア計算物理セミナー2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: Through reading original papers related computational physics, students are encouraged to master how to advance his/her own research, as well as to learn recent developments in the field.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics, Seminar on Frontiers for Computational Physics 1ABCD

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, combustion3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics2C (2.0credits) (フロンティア計算物理セミナー2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: Through reading original papers related computational physics, students are encouraged to master how to advance his/her own research, as well as to learn recent developments in the field.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics, Seminar on Frontiers for Computational Physics 1ABCD

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, combustion3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics2D (2.0credits) (フロンティア計算物理セミナー2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: Through reading original papers related computational physics, students are encouraged to master how to advance his/her own research, as well as to learn recent developments in the field.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics, Seminar on Frontiers for Computational Physics 1ABCD

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, combustion3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Frontiers for Computational Physics2E (2.0credits) (フロンティア計算物理セミナー2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	3 Spring Semester		
Lecturer	Kenji SHIRAISHI Professor	Katsunori YOSHIMATSU Associate Professor	Masaaki Araidai Assistant Professor

●Course Purpose

Aim of the lecture: Through reading original papers related computational physics, students are encouraged to master how to advance his/her own research, as well as to learn recent developments in the field.Attainment target: The students acquire total ability for research and development of computational physics, and practical skills for applying knowledge of computational physics to actual research and development.

●Prerequisite Subjects

Thermodynamics, Electromagnetics, Quantum Mechanics A, Statistical Mechanics AMechanics of Continuum, Physics of Fluids, Applied Mathematics, Seminar on Frontiers for Computational Physics 1ABCD, Frontiers for Computational Physics 2ABCD

●Course Topics

1. Materials science, electronic device, origin of life2. Computational science of fluid, turbulence phenomena, combustion3. Numerical methods

●Textbook

not specified. Suggestions are given during the lectures.

●Additional Reading

not specified. Suggestions are given during the lectures.

●Grade Assessment

Reports and/or Oral Examination

●Notes

There are no specific course requirements.

●Contacting Faculty

Contact to Prof. Kenji Shiraishi shiraishi@imass.nagoya-u.ac.jp

Seminar on Materials science by electron nano-scopic spectroscopy 2A (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:
1. Convey their research subject to others in a clear manner
2. Dicusss the subjects by questions & answers based on their data available

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. CarterTransmission Electron Microscopy, Part 1-42nd ed.Schpringer Verlag
R. F. EgertonElectron Energy-Loss Spectroscopy in the Electron Microscope 3rd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

inar on Materials science by electron nano-scopic spectroscopy 2B (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:
1. Convey their research subject to others in a clear manner
2. Dicusss the subjects by questions & answers based on their data available

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. CarterTransmission Electron Microscopy, Part 1-42nd ed.Schpringer Verlag
R. F. EgertonElectron Energy-Loss Spectroscopy in the Electron Microscope 3rd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

inar on Materials science by electron nano-scopic spectroscopy 2C (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:1. Not only convey their research subject to others in a clear manner but also recognize the background and the present status of their research2. Dicusss the subjects by questions & answers based on their data available more concious about summarizing their achievements at their final stage of the course

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. CarterTransmission Electron Microscopy, Part 1-42nd ed.Schpringer VerlagR. F. EgertonElectron Energy-Loss Spectroscopy in the Electron Microscope 3rd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Materials science by electron nano-scopic spectroscopy 2D (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:
1. Not only convey their research subject to others in a clear manner but also recognize the background and the present status of their research
2. Dicusss the subjects by questions & answers based on their data available more concious about summarizing their achievements at their final stage of the course

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. CarterTransmission Electron Microscopy, Part 1-42nd ed.Schpringer Verlag
R. F. EgertonElectron Energy-Loss Spectroscopy in the Electron Microscope 3rd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Materials science by electron nano-scopic spectroscopy 2E (2.0credits) (ナノ顕微分光物質科学セミナー

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	3 Spring Semester		
Lecturer	Shunsuke MUTO Professor	Masahiro OTSUKA Lecturer	SAITOU Assistant Professor

●Course Purpose

In this seminar, students report the progress in their own research subjects. In each occasion they must prepare resume of their presentation. To develop the skills of the following points are aimed in this seminar:
1. Develop the skills of English writing to publish their work in a scientific journal
2. Develop the skills of effective presentation for scientific meetings and qualification interviews

●Prerequisite Subjects

●Course Topics

●Textbook

●Additional Reading

D. B. Williams, C. B. CarterTransmission Electron Microscopy, Part 1-42nd ed.Schpringer Verlag
R. F. EgertonElectron Energy-Loss Spectroscopy in the Electron Microscope 3rd ed.Schpringer Verlag

●Grade Assessment

●Notes

●Contacting Faculty

Seminar on Quantum Beam Materials Science and Engineering 2A (2.0credits) (量子ビーム物性工学セミナー2A)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	1 Spring Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To practice conducting original research by creating an original answer to a small theme related to a doctoral dissertation.
Achievement goal: To acquire the ability to think for yourself and solve problems.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

A sub-theme from the themes of the student's doctoral dissertation and various problems related to X-ray optics that may become problems in the future are selected.

●Textbook

It will be given according to the topics.

●Additional Reading

It will be given according to the topics.

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty

at seminar

Seminar on Quantum Beam Materials Science and Engineering 2B (2.0credits) (量子ビーム物性工学セミナー2B)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	1 Autumn Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose
Objective: To practice conducting original research by creating an original answer to a small theme related to a doctoral dissertation.
Achievement goal: To acquire the ability to think for yourself and solve problems.

●Prerequisite Subjects
Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics
A sub-theme from the themes of the student's doctoral dissertation and various problems related to X-ray optics that may become problems in the future are selected.

●Textbook
It will be given according to the topics.

●Additional Reading
It will be given according to the topics.

●Grade Assessment
Oral presentation (60%) and examination (40%), Minimum mark for credit: 60/100

●Notes

●Contacting Faculty
at seminar

Seminar on Quantum Beam Materials Science and Engineering 2C (2.0credits) (量子ビーム物性工学セミナー2C

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	2 Spring Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To practice conducting original research by creating an original answer to a small theme related to a doctoral dissertation.
Achievement goal: To acquire the ability to think for yourself and solve problems.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

A sub-theme from the themes of the student's doctoral dissertation and various problems related to X-ray optics that may become problems in the future are selected.

●Textbook

It will be given according to the topics.

●Additional Reading

It will be given according to the topics.

●Grade Assessment

Oral presentation (60%) and examination (40%): Minimam marks for credit: 60/100

●Notes

●Contacting Faculty

at seminar

Seminar on Quantum Beam Materials Science and Engineering 2D (2.0credits) (量子ビーム物性工学セミナー2D

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	2 Autumn Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose

Objective: To practice conducting original research by creating an original answer to a small theme related to a doctoral dissertation.
Achievement goal: To acquire the ability to think for yourself and solve problems.

●Prerequisite Subjects

Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics

A sub-theme from the themes of the student's doctoral dissertation and various problems related to X-ray optics that may become problems in the future are selected.

●Textbook

It will be given according to the topics.

●Additional Reading

It will be given according to the topics.

●Grade Assessment

Oral presentation (60%) and examination (40%), Minimum marks for credit: 60/100

●Notes

●Contacting Faculty

at seminar

Seminar on Quantum Beam Materials Science and Engineering 2E (2.0credits) (量子ビーム物性工学セミナー2E)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Materials Physics
Starts 1	3 Spring Semester
Lecturer	Satoshi MATSUYAMA Associate Professor

●Course Purpose
Objective: To practice conducting original research by creating an original answer to a small theme related to a doctoral dissertation.
Achievement goal: To acquire the ability to think for yourself and solve problems.

●Prerequisite Subjects
Optics, X-ray optics, Quantum Mechanics, Condensed Matter Science, Semiconductor Physics

●Course Topics
A sub-theme from the themes of the student's doctoral dissertation and various problems related to X-ray optics that may become problems in the future are selected.

●Textbook
It will be given according to the topics.

●Additional Reading
It will be given according to the topics.

●Grade Assessment
Oral presentation (60%) and examination (40%), MInimum marks for credit: 60/100

●Notes

●Contacting Faculty
at seminar

Seminar on Physics of Rheology 2A (2.0credits) (レオロジー物理工学セミナー2A)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Spring Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose
Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects
The other seminar courses and the lecture courses on rheology physics.

●Course Topics
For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook
Books related to rheology and/or softmatter physics

●Additional Reading
Books related to rheology and/or softmatter physics

●Grade Assessment
The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes
Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty
Come to Prof. Masubuchi (http://masubuchi.jp)

Seminar on Physics of Rheology 2B (2.0credits) (レオロジー物理工学セミナー2B)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	1 Autumn Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose
Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects
The other seminar courses and the lecture courses on rheology physics.

●Course Topics
For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook
Books related to rheology and/or softmatter physics

●Additional Reading
Books related to rheology and/or softmatter physics

●Grade Assessment
The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes
Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message"

●Contacting Faculty
Come to Prof. Masubuchi (http://masubuchi.jp)

Seminar on Physics of Rheology 2C (2.0credits) (レオロジー物理工学セミナー2C)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Spring Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose

Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects

The other seminar courses and the lecture courses on rheology physics.

●Course Topics

For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook

Books related to rheology and/or softmatter physics

●Additional Reading

Books related to rheology and/or softmatter physics

●Grade Assessment

The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes

Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

Come to Prof. Masubuchi (http://masubuchi.jp)

Seminar on Physics of Rheology 2D (2.0credits) (レオロジー物理工学セミナー2D)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	2 Autumn Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose

Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects

The other seminar courses and the lecture courses on rheology physics.

●Course Topics

For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook

Books related to rheology and/or softmatter physics

●Additional Reading

Books related to rheology and/or softmatter physics

●Grade Assessment

The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes

Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty

Come to Prof. Masubuchi (http://masubuchi.jp)

Seminar on Physics of Rheology 2E (2.0credits) (レオロジー物理工学セミナー2E)

Course Type	Specialized Courses		
Division at course	Doctor's Course		
Class Format	Seminar		
Course Name	Materials Physics		
Starts 1	3 Spring Semester		
Lecturer	Yuuichi MASUBUCHI Professor	Takashi UNEYAMA Associate Professor	Yuya DOI Assistant Professor

●Course Purpose
Through the seminar the participants will learn about the fundamental and advanced topics of rheology physics, as well as the basic manner of research in general.Objective: To be able to understand the fundamentals and applications of rheological physics and engineering, and to be able to communicate them appropriately to others in one's own words.

●Prerequisite Subjects
The other seminar courses and the lecture courses on rheology physics.

●Course Topics
For the research projects by the participants on rheology physics, in this seminar the participants are expected to present their progress and related topics for their own projects. The participants are also expected to stimulate the discussion by themselves. Outstanding researchers outside will give seminar talks occasionally. On the other hand, the participants may be given some opportunities to present their works in the conferences and/or meetings outside.

●Textbook
Books related to rheology and/or softmatter physics

●Additional Reading
Books related to rheology and/or softmatter physics

●Grade Assessment
The score may vary according to the presentation made by the participant, and his behaviors during the discussion.

●Notes
Students must have the Special Experiments and Exercises in Rheological Physics and Engineering. Classes will be conducted face-to-face, remotely, or a combination of the two, depending on the situation. Details will be announced via NUCT. Questions to the instructor should be directed to the NUCT "Message" function. The exchange of opinions among students regarding the class should be conducted through the NUCT function "Message".

●Contacting Faculty
Come to Prof. Masubuchi (http://masubuchi.jp)

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

●Course Purpose

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

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

●Prerequisite Subjects

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

●Course Topics

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

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

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

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

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

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

●Notes

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

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

●Course Purpose

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

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

●Prerequisite Subjects

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

●Course Topics

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

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

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

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

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

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

●Notes

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

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

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

●Course Purpose

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

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

●Prerequisite Subjects

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

●Course Topics

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

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

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

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

Communication adjustment that DP and attendance are raw

I assume this a main component.

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

●Textbook

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

●Additional Reading

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

●Grade Assessment

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

●Notes

No specific requirements.

●Contacting Faculty

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

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

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

●Course Purpose

The purpose of this course is to provide guidance to semester students for advanced science and engineering experiments at the Venture Business Laboratory. Through this research guidance, students will be able to play a comprehensive role as a researcher / educator and instructor in the field in charge of Raman spectroscopy, ionization potential measurement, X-ray diffraction measurement, and molecular 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 Raman spectroscopy, ionization potential measurement, X-ray diffraction measurement, and molecular 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 Raman spectroscopy, ionization potential measurement, X-ray diffraction measurement, and molecular 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 understandinginonefieldfromRamanspectroscopy,ionizationpotentialmeasurement,X-ray diffraction measurement,and molecular simulation.

●Contacting Faculty

Arranging the schedules by e-mail and etc.

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

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

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

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

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

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

●Additional Reading

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

●Grade Assessment

The credits will be given to the students who have had the working days less than or equal to 20 days in the internship company.

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U3 (3.0credits) (研究インターンシップ２ U3)

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

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

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

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

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

●Additional Reading

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

●Grade Assessment

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

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U4 (4.0credits) (研究インターンシップ２ U4)

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

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

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

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

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

●Additional Reading

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

●Grade Assessment

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

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U6 (6.0credits) (研究インターンシップ２ U6)

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

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

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

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

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

●Additional Reading

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

●Grade Assessment

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

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

Research Internship2 U8 (8.0credits) (研究インターンシップ２ U8)

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

●Course Purpose

Research internship is different from conventional internship for a working experience. Staffs in the faculty and instructors in a company cooperate with each other to set up research themes adequate to the doctoral course, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for an advanced research and development in not only a specialized field but also a multidisciplinary field, and a leader capable of making a proper judgment in a research project.

●Prerequisite Subjects

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

●Course Topics

A student applies for a theme for research set up under the cooperation of a company and Nagoya University. Students should attend at the lecture at the university on the duty of confidentiality and the protection of intellectual property rights before starting the internship.

●Textbook

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

●Additional Reading

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

●Grade Assessment

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

●Notes

No specific requirements.

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

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.