Core Inorganic Chemistry (2.0credits) (コア無機化学特論)

Course Type	Basic Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

The purpose of this course is to learn important features of basic and advanced inorganic chemistry in relation to chemical property of each metal through recent research topics.

The aim of this course is to understand recent research topics in relation to chemical property of each metal.

●Prerequisite Subjects

Undergraduate Inorganic Chemistry I, II, III, Analytical Chemistry, Chemistry of Inorganic Materials I, II

●Course Topics

Self-assembly and supramolecular chemistry of metal complexes
Supramolecular catalyst based on metal complex and de novo design of artificial metallo-enzymes
Chemical to electrical energy conversion: Fuel cell electrocatalysts
Structure and Catalysis of Heterogeneous Catalysts
Reaction mechanism and functional modification of metalloenzymes and artificial metalloproteins
TBA

●Textbook

Housecroft Inorganic Chemistry

●Additional Reading

Instructions will be given in the class as necessary.

●Grade Assessment

Students will be evaluated according to Assignment of Homework (reports). The reports will be evaluated on a scale of 100 points, and the pass will be 60 points or more.

●Notes

It is recommended to complete undergraduate Inorganic Chemistry I, II, III.

●Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or through the appointment. Contact by an e-mail is also available.

Core Organic Chemistry (2.0credits) (コア有機化学特論)

Course Type	Basic Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

The course's purpose is to learn essential features of basic and advanced organic chemistry systematically. The course will assist the students to understand the intellectual roots of organic chemistry under the specific topics selectively chosen in organic chemistry and organic metallics to develop the knowledge and appreciation of the organic molecular structures, characterizations, preparations, and reactivities, as well as the corresponding reaction sequences. Students will be able to solve progressive problems in the related fields sequentially.

●Prerequisite Subjects

The students are required to have basic knowledge of basic chemistry, inorganic chemistry, organic chemistry, and physical chemistry.

●Course Topics

Class 1. Molecular Orbitals and the Perspective of Molecular Structures and IsomersClass 2. General Trend of Chemical Reactivity for Organic CompoundsClass 3. Saturated & Unsaturated Aliphatic Molecules and Extended -Electron Systems Class 4. Stereochemistry of the Fundamental Organic Reactions and the Corresponding Mechanisms Class 5. Chemical Kinetics and Thermodynamics in Chemical Reactions of Organic CompoundsClass 6. Overview of Molecular SpectroscopyClass 7. Spectroscopic Assignments of Organic CompoundsClass 8. Functional Groups and their ReactivitiesClass 9. Reactive Functional Groups and Reactivity ManagementsClass 10. Photochemical Ionic Reactions: Aromatic Nucleophilic/Electrophilic SubstitutionsClass 11. Structure, Preparation, and Reactivity of Heterocycles Class 12. Thermal and Photochemical Pericyclic ReactionsClass 13. Rearrangement Reactions of Organic MoleculesClass 14. Organometallic Compounds and Transition Metal CatalysisClass 15. Student Presentations and the Assessments

●Textbook

- Organic Chemistry: Structure and Function (Seventh Edition), Peter Vollhardt and Neil Schore, W. H. Freeman and Company, New York, 2014.- Molecular Orbitals and Organic Chemical Reactions (Reference Edition), Ian Fleming, John Wiley & Sons, Ltd. 2010.

●Additional Reading

- Organic Chemistry (Second Edition), Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford Univ. Press, 2012.- Organometallic Chemistry (Second Edition), Gary O. Spessard and Gary L. Miessler, Oxford Univ. Press, 2010.- Advanced Organic Chemistry (Part B: Reaction and Synthesis, Fifth Edition), Francis A. Carey, Richard J. Sundberg, Springer, 2007.

●Grade Assessment

Grades will be based on the assessment of reports (60%) and presentation (40%)Credits will be awarded to those students who score 60 or more: Grades are as follows: S:100-95, A:94-80, B:79-70, C:69-65, C-:64-60, F:59-0.

●Notes

●Contacting Faculty

Students can communicate with their course instructor face-to-face either in their classes or appointment times. Communication through emails (instructor's email: jyshin321@gmail.com) are also available.

Core Physical Chemistry (2.0credits) (コア物理化学特論)

Course Type	Basic Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

The purpose of the course is to first review the principles and concepts of physical chemistry for graduate students.

●Prerequisite Subjects

Core Organic Chemistry, Core Inorganic Chemistry, and Core Biochemistry

●Course Topics

Part 1: Quantum mechanics of molecules
1. Basics of quantum mechanics
2. Molecular vibration and IR spectroscopy
3. Molecular electronic structure and molecular spectroscopy
4. Molecular symmetry

Part 2: Chemical reactions
5. Thermodynamics and chemical equilibirum
6. Statistical thermodynamics
7. Reaction kinetics
8. Reaction dynamics
9. Processes on solid surfaces

Part 3: Experiments vs. Simulations
10. Thermochemistry
11. Spectroscopy: Raman, IR, and UV-vis
12. Reaction mechanisms and kinetics

Part 4:
13. Students' presentation 1
14. Students' presentation 2
15. Summary and Evaluation

●Textbook

P. Atkins and J de Paula: Atkins’ Physical Chemistry, 11th Ed., Oxford University Press, 2018

●Additional Reading

T. Engel, Quantum Chemistry and Spectroscopy, 3rd Ed., Pearson, 2014.
David W. Ball, Physical Chemistry, 2nd Ed., Cengage Learning, 2015.
D. A. McQuarrie and J. D. Simon, Physical Chemistry: A Molecular Approach, University Science Books, 1997.
J. B. Foresman and Æ Frisch, Exploring Chemistry with Electronic Structure Methods, 3rd Ed., Gaussian, Inc.: Wallingford, CT, 2015.

●Grade Assessment

Reports: 40%, presentations: 40%, and final exam: 20%.
Grade evaluation will be according to the the GPA System at Nagoya University. Students who enrolled AY2020 and onward: "A+": 100-95%, "A": 95-80%, "B": 70-80%, "C": 65-70%, "C-": 60-65%, "F": 60-0%.

●Notes

Active participation in the class will be required--in the form of presentations, discussions, problem solving, etc.

The final evaluation will be oral exam.

●Contacting Faculty

By email or in-person during office hours.

Phone: 789-2480 E-mail: quan.phung@chem.nagoya-u.ac.jp
Office: B221 (Science Building B)

Core Biochemistry (2.0credits) (コア生物化学特論)

Course Type	Basic Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

The aim of this course is to gain an understanding of basic principles as well as the latest topics in various fields of biochemistry, including protein chemistry, peptide chemistry, nucleic acid chemistry, genetic engineering, molecular biology, synthetic biology, bioinorganic chemistry, nanobioscience, bioengineering, structural biology, and bioinformatics.

●Prerequisite Subjects

not in particular, but basic knowledge of biology is necessary

●Course Topics

1. protein chemistry, peptide chemistry
2. nucleic acid chemistry
3. genetic engineering, molecular biology
4. synthetic biology, bioinorganic chemistry
5. nanobioscience, nanobiotechnology
6. bioengineering, bioinformatics
7. structural biology

●Textbook

basically nil. Each teacher might specify the textbooks and references from time to time

●Additional Reading

Fundamentals of Biochemistry: Life at the Molecular Level
Fourth edition by Donald Voet, Judith G. Voet, and Charlotte W. Pratt

●Grade Assessment

Evaluation of Reports

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

●Notes

No requirements for attending this course.

●Contacting Faculty

In communicate with the instructor by face-to-face in the lecture or in the office hour, and by e-mail.

Chemistry Seminar 1A (2.0credits) (化学系セミナー１Ａ)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	1 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literatures in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Chemistry Seminar 1B (2.0credits) (化学系セミナー１Ｂ)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	1 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.
Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Chemistry Seminar 1C (2.0credits) (化学系セミナー１Ｃ)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	2 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Chemistry Seminar 1D (2.0credits) (化学系セミナー１Ｄ)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	2 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Advanced Inorganic Chemistry (2.0credits) (アドバンス無機化学特論)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

Lectures on chemical reaction, synthesis, microstructure and property control of inorganic and related materials (especially advanced nanostructured-materials) will be given based on solid state chemistry and nanotechnology. By learning this lecture, the goal is to be able to understand "synthesis", "characterization" and "functionality" of inorganic solid state materials and nanomaterials.

●Prerequisite Subjects

Inorganic Chemistry 1 with Exercises
Inorganic Chemistry 2 with Exercises
Chemistry of Inorganic Reaction
Inorganic Material Chemistry

●Course Topics

1. Introduction
2. Nanoporous metal complexes and related materials: Synthesis, structures and properties
3. Porous materials prepared via sol-gel methods accompanied by phase separation
4. Mesoporous materials: synthesis and applications
5. Solid oxide fuel cells: Materials, processing and applications
6. Bioceramics: Ceramics in medicine, biology and biomimetics
7. Chemically designed nanomaterials: Synthesis and properties
8. Synthesis of inorganic materials with high performance

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

●Textbook

Textbooks are not designated. Prints are distributed when necessary.

●Additional Reading

[1] “Nanostructures and Nanomaterials: Synthesis, Properties, and Applications (2nd Edition)”, Guozhong Cao and Ying Wang, World Scientific, 2010.
[2] “Ceramic Materials: Science and Engineering (1st Edition)”, C. Barry Carter, M. Grant Norton, Springer, 2007.
[3] “Solid State Chemistry: An Introduction (3rd Edition)”, Lasley E. Smart, Elaine A. Moore, Taylor and Francis, 2005.
[4] “Solid State Chemistry and its Applications (2nd Edition)”, Anthony R. West, Wiley, 2014.
When necessary, other textbooks will be introduced.

●Grade Assessment

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

●Notes

N/A

●Contacting Faculty

Contact each professor directly. Details will be given on each lecture.

Advanced Organic Chemistry (2.0credits) (アドバンス有機化学特論)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

The purpose of this course is to present an overview of cutting-edge organic chemistry, and learn important principles and facets of modern chemistry. The course includes sophisticated catalysts and reagents (organic-based and metal-based) for making useful compounds, designer functional organic molecules with various optoelectronic properties, and synthesis of natural products and biologically active complex molecules. All the lectures will help you to have your overview of organic chemistry for understanding the essence of the modern organic chemistry.

●Prerequisite Subjects

Organic Chemistry 1-5

●Course Topics

1. Organocatalysts for Green Chemistry2. Chiral Catalysts for Enantioselective Synthesis3. Transition Metal Catalysts for Unreactive Bond Activation4. Synthesis of Optoelectronic Materials5. Synthesis of Natural Products and Biologically Active Compoun"

●Textbook

Not specified.

●Additional Reading

Organic Chemistry: Structure and Function 6th ed. K. Peter C. Vollhardt, Neil E. Schore"

●Grade Assessment

Grades will be based on reports. Grades: A+: 100-90% , A: 89-80% , B: 79-70%, C: 69-65%, C-: 64-60%, F:59-0%.

●Notes

●Contacting Faculty

Students can communicate with their lecturers during lectures, office hours, or via email.Contact: Prof. Hideto ITO <ito.hideto@g.mbox.nagoya-u.ac.jp

Advanced Physical Chemistry (2.0credits) (アドバンス物理化学特論)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

This course is designed as a broad survey of modern topics in physical chemistry through an omnibus form of lectures conducted by Professors, Associate Professors, and Lecturers. The teachers will provide the latest stimulative topics in physical chemistry such as carbon nanotubes, graphenes, organometallics, nanoparticles, electronic devices, catalysts, solar cells, etc. All the lectures will help you to have your overview of physical chemistry for understanding the essence of the modern physical chemistry.

●Prerequisite Subjects

The course assumes students have background knowledge of general principles of chemistry, inorganic chemistry, organic chemistry, quantum chemistry, thermodynamics, chemical kinetics and electrochemistry.

●Course Topics

The lecturers will provide you specifics from the cutting-edge topics such as surfaces/interfaces chemistry, science of nanomaterials, electronic band structure, laser chemistry, computer simulation, catalysis chemistry, molecule-based spintronics, solvation theory, etc.

●Textbook

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

●Additional Reading

Appropriate reference books will be introduced by each instructor.

●Grade Assessment

Required work consists of homework assignments. Students must submit reports to each teacher.
Your overall grade in the course will be decided based on the following:
- Every assignment and attitude: 100%

Credits will be awarded to those students who score 60 or more out of 100 points. Grades are as follows:
Enrollees after 2020
A+: 100-95A: 94-80B: 79-70C: 69-65C-: 64-60F: 59-0
Enrollees before 2019
S: 100-90A: 89-80B: 79-70C: 69-60F: 59-0

●Notes

●Contacting Faculty

The teacher in charge of each class will answer student’s questions individually.
Office hours: Monday to Friday, 9:00 to 17:00.
(An appointment must be required by e-mail.)

Advenced Quantum Chemistry (2.0credits) (アドバンス量子化学特論)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

The accurate description of the electronic structure of large molecules is an important topic in the field of quantum chemistry, and is required for the accurate understanding of chemical phenomena. In this class, theoretical concepts for large-scale calculations will be covered.

●Prerequisite Subjects

Quantum ChemistryI & II
Participants should have some familiarity with electronic-structure theory and/or molecular dynamics techniques.

●Course Topics

1. Born-Oppenheimer approximation
2. LCAO-MO theory: Hartree-Fock theory
3. Electron correlation problem
4. Basis sets in quantum chemical calculations
5. Intermolecular interactions
6. Molecular mechanics
7. How to treat a large number of particles (QM/MM, FMO, and DC)

By the end of this course, students should be equipped with knowledge concerning the following:
1. Understand and explain electronic-structure theory.
2. Understand and explain molecular mechanics techniques.
3. Explain characteristics and technical issues of quantum chemical calculations.

●Textbook

Handouts will be distributed in each class.

●Additional Reading

Modern Quantum Chemistry: Introduction to Advanced Electronic Structure Theory (A. Szabo and N.S. Ostlund), Dover Publications, Inc.;

●Grade Assessment

Final examination.
A score of at least 60/100 is necessary to receive a passing grade.

●Notes

See Course List and Graduation Requirements for your program.
Review and be prepared for a quiz given at the start of each class related to the previous week’s material.

●Contacting Faculty

E-mail (fujimotok@chem.nagoya-u.ac.jp)

Advanced Polymer Chemistry (2.0credits) (アドバンス高分子化学)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Lecture
Course Name	Graduate Chemistry
Starts 1	1 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

The purpose of this course is to learn important topics of polymer science. The course begins with basic concepts of polymer, proceeds next to polymerization and synthesis of various polymers, and moves then to characterization, structures, properties, and functions of polymers, and biopolymers.
Upon taking this course, you aim to learn important topics of polymer science, such as what polymers are, how to make polymers, how to characterize polymer properties, how properties are affected by polymer structures, how to design functional polymers, and how biopolymers are different from synthetic polymers. You will get basic knowledge on polymer chemistry first and then abilities to apply the basic knowledge to creating new polymer materials.

●Prerequisite Subjects

Fundamentals of Chemistry, Organic Chemistry, Physical Chemistry, Analytical Chemistry, Biochemistry

●Course Topics

1. Introduction to Polymer
2. Step-Growth Polymerization
3. Free-Radical Addition Polymerization
4. Ionic Polymerization
5. Linear Copolymers and Other Architectures
6. Polymer Stereochemistry
7. Polymerization Reactions Initiated by Metal Catalysts and Transfer Reactions
8. Polymers in Solution
9. Polymer Characterization – Molar Masses
10. Polymer Characterization – Chain Dimensions, Structures, and Morphology
11. The Crystalline State and Partially Ordered Structures
12. The Glassy State and Glass Transition
13. Rheology and Mechanical Properties
14. The Elastomeric State
15. Structure-Property Relations
16. DNA and RNA that Encode Genetic Information as their Sequences
17. Higher-Order Structures of Polypeptides and Protein

Prior to taking each class, read the corresponding part of the textbook. After taking the class, solve the problems in the textbook by yourself. During each class, solve the quizzes.

●Textbook

Polymers: Chemistry and Physics of Modern Materials (J. M. G. Cowie and Valeria Arrighi), 3rd Edition; CRC Press

●Additional Reading

Principles of Polymerization (G. Odian), 4th Edition, Wiley-Interscience

●Grade Assessment

The grading is based on quizzes during classes.
Credits will be awarded to those students who understand basics on synthetic and bio-based polymers, polymerization, polymer characterization, structures, properties, and functions. Advanced understandings will be considered.
A minimum average score of 60 or higher out of 100 should be obtained to pass this course.

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

●Notes

●Contacting Faculty

Students can communicate with their lecturers after lectures.

Experiments and Exercises in Chemistry I (4.0credits) (化学系特別実験及び演習 I)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Experiment and Practice
Course Name	Graduate Chemistry
Starts 1	1 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

Objectives and any other requirements for this course depend on the laboratory where students belong (refer to the course syllabus at each lab.)

●Prerequisite Subjects

Fundamental understandings of required chemistry courses

●Course Topics

The contents of this course depend on the laboratories where students belong
(refer to the course syllabus at each lab.)

●Textbook

There is no prescribed textbook. Important handouts/papers will be given or chosen as needed during the seminar.

●Additional Reading

Some instructive references will be informed by the lecturer during the classes.

●Grade Assessment

The levels attained will be evaluated via performance in preparation for the graduate work.

●Notes

●Contacting Faculty

Any questionnaires are welcome during and after the seminar and experiments or separately via emai

Experiments and Exercises in Chemistry II (4.0credits) (化学系特別実験及び演習 II)

Course Type	Specialized Courses
Division at course	Master's Course
Class Format	Experiment and Practice
Course Name	Graduate Chemistry
Starts 1	2 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

Objectives and any other requirements for this course depend on the laboratory where students belong(refer to the course syllabus at each lab.)

●Prerequisite Subjects

Fundamental understandings of required chemistry courses

●Course Topics

The contents of this course depend on the laboratories where students belong(refer to the course syllabus at each lab.)

●Textbook

There is no prescribed textbook. Important handouts/papers will be given or chosen as needed during theseminar.

●Additional Reading

Some instructive references will be informed by the lecturer during the classes.

●Grade Assessment

The levels attained will be evaluated via performance in preparation for the graduate work.

●Notes

●Contacting Faculty

Any questionnaires are welcome during and after the seminar and experiments or separately via emai

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	Graduate Chemistry
Starts 1	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 paperlist essential components of each section of research papertype short multiple-paragraph essays with appropriate punctuationorally 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 exchange4. Basics of academic writing in English (2) 5. Basic structure of science & technology research paper (2) 6. Writing (2), feedback and opinion exchange7. Basic structure of science & technology research paper (3)8. Writing (3), feedback and opinion exchangeStudents 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. TheUniversity 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.Classes are conducted online using Zoom.

●Contacting Faculty

Email address; m.ito5628@gmail.com

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

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

●Course Purpose

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

●Prerequisite Subjects

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

●Course Topics

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

(7) Individual presentations I
(8) Individual presentations

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

●Textbook

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

●Additional Reading

1The Japan Times
2:

●Grade Assessment

Individual presentation: 50%
Active class participation: 50%

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

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

●Notes

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

●Contacting Faculty

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

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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for 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

Depends on each research group of the student and the internship company

●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

not specified.

●Additional Reading

not specified.

●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

Depends on each research group of the student and the internship company

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for 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
Depends on each research group of the student and the internship company

●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
not specified.

●Additional Reading
not specified

●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
Depends on each research group of the student and the internship company

●Contacting Faculty
The questions will be answered by the direct supervisors as needed at the internship.

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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for 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

Depends on each research group of the student and the internship company

●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

not specified.

●Additional Reading

not specified.

●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

Depends on each research group of the student and the internship company

●Contacting Faculty

The questions will be answered by the direct supervisors as needed at the internship.

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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for 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
Depends on each research group of the student and the internship company

●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
not specified.

●Additional Reading
not specified.

●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
Depends on each research group of the student and the internship company

●Contacting Faculty
The questions will be answered by the direct supervisors as needed at the internship.

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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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, and supervise a long-term internship for 1-6 months. This course aims at training of a person who has ability for 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

Depends on each research group of the student and the internship company

●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

not specified.

●Additional Reading

not specified.

●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

Depends on each research group of the student and the internship company

●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１ U2)

Course Type	Comprehensive engineering courses
Division at course	Master's Course
Class Format	Practice
Course Name	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'. Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 1 U3 (3.0credits) (研究室ローテーション１ U3)

Course Type	Comprehensive engineering courses
Division at course	Master's Course
Class Format	Practice
Course Name	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories
U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'.
Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 1 U4 (4.0credits) (研究室ローテーション１ U4)

Course Type	Comprehensive engineering courses
Division at course	Master's Course
Class Format	Practice
Course Name	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories
U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'.
Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 1 U6 (6.0credits) (研究室ローテーション１ U6)

Course Type	Comprehensive engineering courses
Division at course	Master's Course
Class Format	Practice
Course Name	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'. Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 1 U8 (8.0credits) (研究室ローテーション１ U8)

Course Type	Comprehensive engineering courses
Division at course	Master's Course
Class Format	Practice
Course Name	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'. Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Chemistry Seminar 2A (2.0credits) (化学系セミナー2A)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	1 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Chemistry Seminar 2B (2.0credits) (化学系セミナー2B)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	1 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Chemistry Seminar 2C (2.0credits) (化学系セミナー2C)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	2 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Chemistry Seminar 2D (2.0credits) (化学系セミナー2D)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	2 Spring Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Chemistry Seminar 2E (2.0credits) (化学系セミナー2E)

Course Type	Specialized Courses
Division at course	Doctor's Course
Class Format	Seminar
Course Name	Graduate Chemistry
Starts 1	3 Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

In this class, we will perform the discussions on the reference books or literature in conjunction with the chemistry and biochemistry. We will feed the basics about chemistry and biochemistry in English, and discuss a research theme deeply. Students will obtain application ability, a process of the study, and a way of thinking about the inventions.

●Prerequisite Subjects

All classes on chemistry and biochemistry

●Course Topics

Presentation and discussion on recent relevant literatures. Gene Engineering and Molecular Biology, Bioprocess Engineering, Environmental Biotechnology, Catalysis in Organic Synthesis, Biopolymer Chemistry, Structural Biotechnology, Cell and Molecular Bioengineering, Theoretical and Computational Chemistry, Physical Chemistry of Polymers, Organic Material Chemistry, Organic Synthesis, Organic Chemistry of Macromolecules, Organic Reactions, Inorganic Material Chemistry, Applied Analytical Chemistry, Bioanalytical Chemistry, Eco Nano Materials Science, Function Design Chemistry, Organic Conversion Chemistry, Chemistry of Inorganic Reactions, Crystalline State Chemistry, Material Design Chemistry, Functional Materials Engineering, Division of Environmental Research, Division of Energy Science Research, Molecular Design.

●Textbook

Textbooks and papers will be suggested in each research group.

●Additional Reading

References will be introduced in the class.

●Grade Assessment

Depend on research group. Evaluations are based on seminar discussions and reports.Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Ask to the corresponding Professors in each research group.

Topics in International Chemistry 10 (1.0credits) (国際化学特論Ｘ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Lecture	
Course Name	Graduate Chemistry	
Starts 1	1 Spring and Autumn Semester	
Starts 2	2 Spring and Autumn Semester	
Lecturer	InternationalFaculty	Faculty of Chemistry

●Course Purpose

The purpose of the course is to learn about the latest international trends in the field of chemistry. Lecturers for this course are professors of chemistry invited from overseas, and they teach courses in their specialties.

●Prerequisite Subjects

Depends on each lecturer of this course

●Course Topics

Lecturer names, class dates, and other details will be notified in due course.

●Textbook

None

●Additional Reading

None

●Grade Assessment

Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Depends on each lecturer of this course

Topics in International Chemistry 11 (1.0credits) (国際化学特論ＸＩ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Lecture	
Course Name	Graduate Chemistry	
Starts 1	1 Spring and Autumn Semester	
Starts 2	2 Spring and Autumn Semester	
Lecturer	InternationalFaculty	Faculty of Chemistry

●Course Purpose

The purpose of the course is to learn about the latest international trends in the field of chemistry. Lecturers for this course are professors of chemistry invited from overseas, and they teach courses in their specialties.

●Prerequisite Subjects

Depends on each lecturer of this course

●Course Topics

Lecturer names, class dates, and other details will be notified in due course.

●Textbook

None

●Additional Reading

None

●Grade Assessment

Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Depends on each lecturer of this course

Topics in International Chemistry 12 (1.0credits) (国際化学特論ＸⅡ)

Course Type	Specialized Courses	
Division at course	Doctor's Course	
Class Format	Lecture	
Course Name	Graduate Chemistry	
Starts 1	1 Spring and Autumn Semester	
Starts 2	2 Spring and Autumn Semester	
Lecturer	InternationalFaculty	Faculty of Chemistry

●Course Purpose

The purpose of the course is to learn about the latest international trends in the field of chemistry. Lecturers for this course are professors of chemistry invited from overseas, and they teach courses in their specialties.

●Prerequisite Subjects

Depends on each lecturer of this course

●Course Topics

Lecturer names, class dates, and other details will be notified in due course.

●Textbook

None

●Additional Reading

None

●Grade Assessment

Credits will be awarded to those students who score 60 or more.

●Notes

●Contacting Faculty

Depends on each lecturer of this course

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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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

Depends on each research group of the student and the internship company

●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

not specified.

●Additional Reading

not specified

●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

Depends on each research group of the student and the internship company.

●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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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

Depends on each research group of the student

●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

not specified.

●Additional Reading

not specified.

●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

Depends on each research group of the student and the internship company.

●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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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

Depends on each research group of the student

●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

not specified.

●Additional Reading

not specified.

●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

Depends on each research group of the student and the internship company.

●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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●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

not specified.

●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

not specified.

●Additional Reading

not specified.

●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

Depends on each research group of the student and the internship company.

●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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose

●Prerequisite Subjects
not specified.

●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
not specified.

●Additional Reading
not specified.

●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
Depends on each research group of the student and the internship company.

●Contacting Faculty
The questions will be answered by the direct supervisors as needed at the internship.

Laboratory Visit 2 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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories
U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'.
Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 2 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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories
U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'.
Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 2 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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories
U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'.
Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 2 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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories
U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'.
Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.

Laboratory Visit 2 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	Graduate Chemistry
Starts 1	1 Spring and Autumn Semester
Lecturer	Faculty of Chemistry

●Course Purpose
The aim is to expand the ability as a researcher by conducting thesis research at different laboratories.

●Prerequisite Subjects
None in particular

●Course Topics
conducting thesis research at different laboratories
U2, U3; short term basic research, U4, U6, U8; long term advanced research

●Textbook
None in particular

●Additional Reading
None in particular

●Grade Assessment
Credits will be awarded to those students who score 'Pass'.
Thesis supervisor will make overall evaluation based on 1) credit hours, 2) research report and 3) evaluation by the host researcher.

●Notes
Depends on mutual laboratories

●Contacting Faculty
The questions will be answered by the direct supervisors at the mutual laboratories.