Subject Code	SD21100013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Seminar in Creative Molecular Science		
Subject Name(English)	Seminar in Creative Molecular Science		
Subject Number	SBCMS1701		
Credits	2 Credits	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to learn current research topics in the field of creative molecular science to gain an overview of developments in this field.		
Goal of the Subject	The goals of this course will be informed at the beginning of the class.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be based on lab reports and assessment of performance in the seminar.		
Comments to Students			
Teaching Materials	Teaching materials will be introduced in the class.		
Remarks1			
Remarks2			

Subject Code	SD21110013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Seminar in Functional Molecular Science		
Subject Name(English)	Seminar in Functional Molecular Science		
Subject Number	SBFMS1701		
Credits	2 Credits	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to learn current research topics in the field of functional molecular science to gain an overview of developments in this field.		
Goal of the Subject	The goals of this course will be informed at the beginning of the class.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be based on lab reports and assessment of performance in the seminar.		
Comments to Students			
Teaching Materials	Teaching materials will be introduced in the class.		
Remarks1			
Remarks2			

Subject Code	SD21120013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Leadership Training Program		
Subject Name(English)	Leadership Training Program		
Subject Number	SBLTP1701		
Credits	2 Credits	Teaching Method	Special Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	We will develop "leadership" and "communication" abilities based on real instructing experience by setting opportunities for practical educational experience at high school in which graduate students take the initiative.		
Goal of the Subject	Acquisition of education and practical skills through guidance of high school students aiming for presentation at the Grand Contest on Chemistry for High School Students.		
Contents of the Subject /Subject Plan	Students go to a high school (or a college of technology) where high school students (college students) is planning entry in Grand Contest on Chemistry for High School Students and teaches, consults and discusses research conducted by high school students (college students) in cooperation with high school teachers (college teachers). Additionally, students provide instruction from time to time by e-mail and telephone. Through these experiences, students will acquire leadership skills and communication skills practically.		
Preparation and Review	I will show students separately.		
Evaluation Method	Students will be evaluated based on student reports and high school teacher reports.		
Comments to Students	Review the undergraduate education of the university and the general chemistry learned in the previous doctoral program.		
Teaching Materials	none		
Remarks1			
Remarks2			

Subject Code	SD21130013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Academic Exchange Study		
Subject Name(English)	Academic Exchange Study		
Subject Number	SBAES1701		
Credits	2 Credits	Teaching Method	Special Seminar
Main Lecturer	Yoshio Teki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to learn research fields that differ from their advanced research for doctoral thesis.		
Goal of the Subject	The goal of this course is for students to have the ability and the wide field of vision for the different research field from their advanced research for doctoral thesis or the interdisciplinary researches		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review	Course contents will be provided at the beginning of the class.		
Evaluation Method	Grading will be based on reports and assessment of performance in the research or the seminar attended in the different fields from their advanced research for doctoral thesis.		
Comments to Students	Students are expected to attend actively to the research or the seminar.		
Teaching Materials	Guidance will be provided at the beginning of the class.		
Remarks1			
Remarks2			

Subject Code	SD21140013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Interdisciplinary Planner Training Program		
Subject Name(English)	Interdisciplinary Planner Training Program		
Subject Number	SBIPT1701		
Credits	2 Credits	Teaching Method	Special Seminar
Main Lecturer	Toshiyuki Moriuchi		
Main Theme of the Subject	This class fosters interdisciplinary and international perspectives through short-term overseas dispatch and international research exchange.		
Goal of the Subject	The purpose of this class is to conduct short-term dispatch to overseas collaborative research laboratories, presentations and discussions at international conferences, discussions with foreign researchers invited at international seminars, etc. to foster international interdisciplinary researchers.		
Contents of the Subject /Subject Plan	(1) The teacher will do with consultation and confirmation of the applicant's hope and implementation plan with the supervising advisor.(2) Following the implementation plan, short-term stay at overseas collaborative research laboratories, presentations and discussions at international conferences, discussions with foreign researchers invited at international seminars, etc, will be carried out.(3) The student submits a report on the contents of the studies.(4) The teacher evaluates the submitted report from the viewpoint of the achievement level of the goal.		
Preparation and Review	It will be announced separately.		
Evaluation Method	The teacher evaluates the submitted report from the viewpoint of the achievement level of the goal.		
Comments to Students	We would like you to expand your perspective by actively participating.		
Teaching Materials	It will be announced separately.		
Remarks1			
Remarks2			

Subject Code	SD23010013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Advanced Research Course for Doctoral Thesis of Science		
Subject Name(English)	Advanced Research Course for Doctoral Thesis of Science		
Subject Number	SBARC1701		
Credits	3 Credits	Teaching Method	Seminar／Laboratory
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to help students cultivate the ability to organize an academic discipline by developing knowledge and experimental skills to conduct research projects as well as by improving peripheral science. Students are expected to cultivate leadership for younger students and to acquire the knowledge to act as an independent research leader. In addition, students are expected to develop the skill and ability to disseminate research findings in English.		
Goal of the Subject	The goals of this course are to Obtain the highly advanced knowledge and skills for research experiments.Acquire communication and discussion skills in English by disseminating research findings to the world.Cultivate research leadership for undergraduate and Master's course students.Obtain the ability to solve problems and to set original research projects as an independent researcher.		
Contents of the Subject /Subject Plan	Students will belong to one of the following labs and do chemical research provided by a supervisor in each lab. Field of Physical Chemistry: Quantum Functionality Materials, Molecular Physical Chemistry, Photophysical Chemistry, Biophysical Chemistry Field of Organic Chemistry: Synthetic Organic Chemistry, Molecular Conversion, Physical Organic Chemistry, Organic Reaction Chemistry, Fine Organic Chemistry Field of Inorganic Chemistry: Advanced Analytical Chemistry, Bio-functional Molecular Design, Hybrid Molecular Chemistry, Function Chemistry Students are expected to (1) Set experimental plans on the basis of the research projects provided by their supervisors. Students are also encouraged to give younger students guidance in the study based on the research plan.(2) Understand the background and significance of the research projects by online information retrieval. Students will also be able to extend the research project.(3) Be able to summarize the research results and present them at at domestic and international meetings.(4) Acquire skills necessary for preparation and submission of research papers in scientific journals.(5) Pass cross-sectional research proposals (proposal defense).		
Preparation and Review			
Evaluation Method	Grading will be based on assessment of a performance to the research subjects, publishing capability of the studies, and research leadership for undergraduate and Master's course students. Students must present their research results in the scientific meetings and to refereed academic journals. Students must pass the proposal defense.		
Comments to Students			
Teaching Materials	Students are required to use specialized books and academic journals, which are selected by themselves, supervisors, and lab's members.		
Remarks1			
Remarks2			

Subject Code	SD23020013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Advanced Research Course for Doctoral Thesis of Science		
Subject Name(English)	Advanced Research Course for Doctoral Thesis of Science		
Subject Number	SBARC2801		
Credits	3 Credits	Teaching Method	Seminar／Laboratory
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to help students cultivate the ability to organize an academic discipline by developing knowledge and experimental skills to conduct research projects as well as by improving peripheral science. Students are expected to cultivate leadership for younger students and to acquire the knowledge to act as an independent research leader. In addition, students are expected to develop the skill and ability to disseminate research findings in English.		
Goal of the Subject	The goals of this course are to Obtain the highly advanced knowledge and skills for research experiments.Acquire communication and discussion skills in English by disseminating research findings to the world.Cultivate research leadership for undergraduate and Master's course students.Obtain the ability to solve problems and to set original research projects as an independent researcher.		
Contents of the Subject /Subject Plan	Students will belong to one of the following labs and do chemical research provided by a supervisor in each lab. Field of Physical Chemistry: Quantum Functionality Materials, Molecular Physical Chemistry, Photophysical Chemistry, Biophysical Chemistry Field of Organic Chemistry: Synthetic Organic Chemistry, Molecular Conversion, Physical Organic Chemistry, Organic Reaction Chemistry, Fine Organic Chemistry Field of Inorganic Chemistry: Advanced Analytical Chemistry, Bio-functional Molecular Design, Hybrid Molecular Chemistry, Function Chemistry Students are expected to (1) Set experimental plans on the basis of the research projects provided by their supervisors. Students are also encouraged to give younger students guidance in the study based on the research plan.(2) Understand the background and significance of the research projects by online information retrieval. Students will also be able to extend the research project.(3) Be able to summarize the research results and present them at at domestic and international meetings.(4) Acquire skills necessary for preparation and submission of research papers in scientific journals.(5) Pass cross-sectional research proposals (proposal defense).		
Preparation and Review			
Evaluation Method	Grading will be based on assessment of a performance to the research subjects, publishing capability of the studies, and research leadership for undergraduate and Master's course students. Students must present their research results in the scientific meetings and to refereed academic journals. Students must pass the proposal defense.		
Comments to Students			
Teaching Materials	Students are required to use specialized books and academic journals, which are selected by themselves, supervisors, and lab's members.		
Remarks1			
Remarks2			

Subject Code	SD23030013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Advanced Research Course for Doctoral Thesis of Science		
Subject Name(English)	Advanced Research Course for Doctoral Thesis of Science		
Subject Number	SBARC3901		
Credits	2 Credits	Teaching Method	Seminar／Laboratory
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to help students cultivate the ability to organize an academic discipline by developing knowledge and experimental skills to conduct research projects as well as by improving peripheral science. Students are expected to cultivate leadership for younger students and to acquire the knowledge to act as an independent research leader. In addition, students are expected to develop the skill and ability to disseminate research findings in English.		
Goal of the Subject	The goals of this course are to Obtain the highly advanced knowledge and skills for research experiments. Acquire communication and discussion skills in English by disseminating research findings to the world. Cultivate research leadership for undergraduate and Master's course students. Obtain the ability to solve problems and to set original research projects as an independent researcher.		
Contents of the Subject /Subject Plan	Students will belong to one of the following labs and do chemical research provided by a supervisor in each lab. Field of Physical Chemistry: Quantum Functionality Materials, Molecular Physical Chemistry, Photophysical Chemistry, Biophysical Chemistry Field of Organic Chemistry: Synthetic Organic Chemistry, Molecular Conversion, Physical Organic Chemistry, Organic Reaction Chemistry, Fine Organic Chemistry Field of Inorganic Chemistry: Advanced Analytical Chemistry, Bio-functional Molecular Design, Hybrid Molecular Chemistry, Function Chemistry Students are expected to (1) Set experimental plans on the basis of the research projects provided by their supervisors. Students are also encouraged to give younger students guidance in the study based on the research plan.(2) Understand the background and significance of the research projects by online information retrieval. Students will also be able to extend the research project.(3) Be able to summarize the research results and present them at at domestic and international meetings.(4) Acquire skills necessary for preparation and submission of research papers in scientific journals.(5) Pass cross-sectional research proposals (proposal defense).		
Preparation and Review			
Evaluation Method	Grading will be based on assessment of a performance to the research subjects, publishing capability of the studies, and research leadership for undergraduate and Master's course students. Students must present their research results in the scientific meetings and to refereed academic journals. Students must pass the proposal defense.		
Comments to Students			
Teaching Materials	Students are required to use specialized books and academic journals, which are selected by themselves, supervisors, and lab's members.		
Remarks1			
Remarks2			

Subject Code	SD40010033	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	International Advanced Research Course for Doctoral Thesis of Science 1		
Subject Name(English)	International Advanced Research Course for Doctoral Thesis of Science 1		
Subject Number			
Credits	1 Credit	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to gain research experience abroad.		
Goal of the Subject	The goals of this course are to (1) Develop and achieve a dissertation research project of the doctoral course by the research experience abroad. (2) Join the scientific community of overseas students and researchers in the research field.		
Contents of the Subject /Subject Plan	Students will be advised about how to select the overseas university and research institute, how to plan a research project and experimental procedures, how to present the research results in English. Students are required to provide the research reports.		
Preparation and Review			
Evaluation Method	Grading will be based on assessment of the research progress and results. Your grade will also be decided based on the presentation and communication skills abroad.		
Comments to Students	Before registration of the course, students should be approved by their supervisors.		
Teaching Materials			
Remarks1			
Remarks2			

Subject Code	SM21300011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Selected Topics in Exploring Molecular Chemistry 1		
Subject Name(English)	Selected Topics in Exploring Molecular Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Yoshinosuke Usuki		
Main Theme of the Subject	The course deals with topics of the synthetic methods, unique properties, diverseness, and responsivity of selected molecules and materials, which exist in large numbers. The aim of this course is to help students develop their creative thinking for key molecules and materials for the future.		
Goal of the Subject	The goals of this course will be informed at the beginning of the class.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be announced at the beginning of the class.		
Comments to Students			
Teaching Materials	Teaching materials will be provided at the beginning of the class.		
Remarks1			
Remarks2			

Subject Code	SM21560011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Core Organic Chemistry		
Subject Name(English)	Core Organic Chemistry		
Subject Number	SBORG1501		
Credits	2 Credits	Teaching Method	Lecture
Main Lecturer	Yoshiki Morimoto		
Main Theme of the Subject	Materials synthesis is a basic academic discipline related to any science. This course deals with a basis of selectivity and oxidation-reduction reactions, a foundation of functional group modifications, in organic synthesis at a graduate course level. In the latter half of this course, molecular interactions with weak chemical bonds will be discussed. These are a indispensable concept to understand biological signaling, molecular function, and chemical outcomes.		
Goal of the Subject	The aim of this class is to understand the chemical reactions and stereoselectivities in the organic chemistry journals and the basic principle of molecular interactions.		
Contents of the Subject /Subject Plan	1st Factors controlling selectivity: kinetic control and thermodynamic control 2nd Factors controlling selectivity: electrostatic interaction and orbital interaction, solvent effect, and neighboring group participation 3rd Factors controlling selectivity: regioselectivity and chemoselectivity 4th Stereospecificity and stereoselectivity in reactions of cyclic and acyclic compounds 5th Stereoselectivity in reactions of acyclic compounds and anomeric effect 6th Functional group modifications: reduction 7th Functional group modifications: oxidation 8th Basic of molecular interaction 9th Non-covalent chemical bonding 10th Octanol/water partition 11th GC and normal-phased chromatography 12th Reverse-phased chromatography 13th Affinity chromatography 14th Molecular interaction of biological molecules 15th Examination		
Preparation and Review	It is recommended that the students have prepared for the class in advance.		
Evaluation Method	The students will be graded as a whole of attendances, reports, examinations, and so forth.		
Comments to Students	The students have to have learned organic chemistry at the level of Bachelor's degree.		
Teaching Materials	Teaching materials will be provided in the class.Reference books: Eds: Ryoji Noyori et al. "Lectures in Graduate Course: Organic Chemistry I and II," Tokyo Kagaku Dojin etc.		
Remarks1			
Remarks2			

Subject Code	SM21570011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Core Inorganic Chemistry		
Subject Name(English)	Core Inorganic Chemistry		
Subject Number	SBING1501		
Credits	2 Credits	Teaching Method	Lecture
Main Lecturer	Hiroyuki Miyake		
Main Theme of the Subject	By learning fundamental matters on molecular symmetry and group theory, students understand that the concept of symmetry can be applied to the construction of molecular orbitals and analysis of molecular vibrations. In addition, the basic transition metal - carbon bonds in organometallic chemistry are outlined, and the bonds between transition metal - main-group elements (Si, B, P, S, etc.) are explained.		
Goal of the Subject	Irrespective of inorganic chemistry and organic chemistry, transition metal complexes are now widely used. The aim of this course is a systematical acquirement of the basis for helping to understand the ideas and phenomena which are essential for handling transition metal complexes.		
Contents of the Subject /Subject Plan	1. Molecular Symmetry; Symmetry operations and symmetry elements 2. Molecular Symmetry; Assignment of point groups and character tables 3. Molecular Symmetry; Reduction of representation 4. Molecular Symmetry; Molecular vibrations 5. Molecular Symmetry; Projection operators 6. Molecular Symmetry; Construction of molecular orbitals 7. Molecular Symmetry; Midterm exam and commentary 8. Transition metal complex with group 14 element ligand(s); silyl complex 9. Transition metal complex with group 14 element ligand(s); h2-silane, silylene complex 10. Transition metal complex with group 14 element ligand(s); Si-containing three membered metallacycle complex, silyl-bridged multi-nuclear complex 11. Transition metal complex with group 13 element ligand(s); M-B complex 12. Transition metal complex with group 13 element ligand(s); M-E complex (E = Al, Ga, In, Tl) 13. Transition metal complex with group 15 element ligand(s) 14. Transition metal complex with group 16 element ligand(s) 15. Term-end exam and commentary		
Preparation and Review	Handouts for each lecture will be distributed. Be sure to confirm the contents in advance of the class. After lecture, students should summarize the points of the lecture by themselves and solve designated exercises one by one.		
Evaluation Method	Normal point (short test) 10%, test (midterm and term-end exams) 90%.		
Comments to Students	Before the class, students are required to review “inorganic chemistry course” learned in undergraduate education of the university.		
Teaching Materials			
Remarks1			
Remarks2			

Subject Code	SM21580011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Core Physical Chemistry		
Subject Name(English)	Core Physical Chemistry		
Subject Number	SBPHY1501		
Credits	2 Credits	Teaching Method	Lecture
Main Lecturer	Kazunobu Sato		
Main Theme of the Subject	Quantum physical chemistry and spectroscopy are essential for students in chemistry to understand modern molecular materials science. In this class, the students will learn the foundations of the modern physical chemistry and molecular spectroscopy. Through studying basic knowledge in physical chemistry, they will acquire abilities to apply its skill to develop the materials science.		
Goal of the Subject	The goal of this class is to learn the foundations of modern physical chemistry and molecular spectroscopy in order to study and develop the molecular materials science.		
Contents of the Subject /Subject Plan	1. Introduction of quantum theory 2. Foundations of quantum theory 3. Time-dependent quantum mechanics and chemistry 4. Atomic spectrum and electronic structure 5. Quantum theory of chemical bonding 6. Molecular electronic structures and MO theory 7. Introductory density functional theory 8. VUV Chemistry: Introduction 9. VUV Chemistry: Rydberg State 10. X-ray Chemistry: Introduction 11. X-ray Chemistry: XPS 12. X-ray Chemistry: XRF 13. X-ray Chemistry: XAFS 14. Electron Beam Chemistry: TEM, EDS, EELS		
Preparation and Review	Please take enough time to prepare and review for the class based on the distributed materials and scientific papers recommended.		
Evaluation Method	A grade will be evaluated based on the reports submitted.		
Comments to Students	We hope the students learn the foundations of quantum physical chemistry and molecular spectroscopy, and acquire knowledge and abilities to apply skills to develop their own research.		
Teaching Materials	Additional lecture materials are given in the class. The materials in the 8-14th lectures will be available from the web site, www.laserchem.jp.		
Remarks1			
Remarks2			

Subject Code	SM21590011	Offering Academic Year/Semester	2019 Second Semester
Subject Name	Creative Molecular Science		
Subject Name(English)	Creative Molecular Science		
Subject Number	SBCMS1501		
Credits	2 Credits	Teaching Method	Lecture
Main Lecturer	Yoshio Teki		
Main Theme of the Subject	Quantum mechanics and electronic state theory are essential to understand the properties of molecular substances in the field of molecular science.The first half of this class covers basics of the magnetic properties (magnetism) of molecular substances and methods to study electronic states of the molecules, where magnetic susceptibility measurement and ESR (including time-domain ESR) spectroscopy will be topics of the methods.The latter half lectures about qualitative estimation of the molecular structures, electronic absorption, and reactions of metal complexes exploiting the character tables introduced in the group theory.		
Goal of the Subject	In the first half of the class, students are supposed to understand the basics of magnetism, origin of magnetism based on quantum theory, exchange interaction, and electron spin resonance spectroscopy through reviewing and establishing related knowledge with the class learned in the undergraduate course.The latter half starts at reviewing the chemistry group theory learned in the undergraduate course to describe symmetry of molecules. The symmetry of molecules is important in understanding the energy and reactivity of the molecules. Students are supposed to acquire methods to understand the structure and reactivity of molecules by qualitatively determining the ligand field stabilization energy.		
Contents of the Subject /Subject Plan	1st. Origin of magnetism, electron spin, Zeeman interaction and Larmor frequency, diamagnetism 2nd. Paramagnetism of localized electrons and Curie's law, a method to measure magnetic susceptibility 3rd. Paramagnetism of conduction electrons 4th Exchange interaction and its origin, basics of molecular magnetism (organic magnetic material) 5th Weiss's molecular field approximation and Curie-Weiss rule, ferromagnetism, antiferromagnetism 6th Ferrimagnetic materials and antiferromagnetic materials 7th Basics of electronic spin resonance and advanced electron spin resonance (time domain measurement) methods 8th Introduction to the group theory - how to read and use character tables - 9th Estimation of the stable form of metal complex (1) - Angular overlap model - 10th Estimation of the stable form of metal complex (2) - Ligand field stabilization energy estimated by angular overlap model - 11th Electronic transition by the group theory (1) - Space integral of wave functions - 12th Electronic transition by the group theory (2) - Interaction of wave function with electromagnetic wave 13th Molecular structure by the group theory (1) - Introduction to second order Janterre effect - 14th Molecular structure by the group theory (2) - Some examples of second order Janterre effect - 15th Annotation to homework problems regarding the molecular structure and electronic transitions		
Preparation and Review	Students are encouraged to review and understand the contents of lecture prior to the next lecture.		
Evaluation Method	The score of the class is evaluated comprehensively from the marks given for class participation and achievements of homework report and problems.		
Comments to Students	Prior to the first half, reviewing thermodynamics, quantum theory, magnetic resonance learned in the undergraduate course is highly encouraged.Prior to the latter half, reviewing the group theory learned in the undergraduate course is highly encouraged.		
Teaching Materials			
Remarks1			
Remarks2			

Subject Code	SM21600011	Offering Academic Year/Semester	2019 Second Semester
Subject Name	Functional Molecular Science		
Subject Name(English)	Functional Molecular Science		
Subject Number	SBFMS1501		
Credits	2 Credits	Teaching Method	Lecture
Main Lecturer	Tetsuya Satoh		
Main Theme of the Subject	This course introduces basic transition metal-catalyzed reactions, which have become one of the most important methods in the synthesis of functional molecules. The reactions using palladium catalysts, which are most widely used for organic synthesis, will be described, and then cross-coupling reaction and the recent topics of direct functionalization of carbon-hydrogen bonds will also be described.		
Goal of the Subject	Functional molecular science is an academic field aiming at the development of new reaction methods and the creation of functional substances related to general physical properties involving bio-related materials on the basis of molecular transformation and synthesis. This course deals with transition metal-catalyzed reactions such as cross coupling, which became an indispensable reaction in contemporary functional molecule synthesis. The goal of this course is to understand the basic organometallic chemistry and the mechanism of catalytic reactions.		
Contents of the Subject /Subject Plan	1. History of Organometallic Compounds 2. Eighteen Electron Rule 3. Preparation of Organometallic Compounds 4. Oxidative Addition, Reductive Elimination, Insertion, Elimination, and Transmetlation 5. Construction of a Catalytic Cycle 6. Proposal of a Catalytic Cycle 7. Mid-term Exam and elucidation 8. Chemistry on Palladium 9. Palladium-Catalyzed Reactions 10. Cross-Coupling: Background and Insight 11. Cross-Coupling: Application 12. C-H Activation: Background 13. C-H Activation: Alkylation and Alkenylation 14. C-H Activation: Arylation 15. Final Exam and elucidation		
Preparation and Review			
Evaluation Method	Grading will be decided based on usual performance score (attitude in class, quizzes)(40%) and Exams (mid-term, final)(60%).		
Comments to Students			
Teaching Materials	Teaching materials will be provided in the class.		
Remarks1			
Remarks2			

Subject Code	SM21620011	Offering Academic Year/Semester	2019 Second Semester
Subject Name	Creative Advanced Organic Chemistry II		
Subject Name(English)	Creative Advanced Organic Chemistry II		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	π-Conjugated organic molecules with unique structures and properties can be obtained using state-of-the-art synthetic method. Differentπ-conjugate systems with various properties can be created by simply changing the form (topology) of the π-conjugated network and the type of constituent atoms. Currently, research on π-conjugated systems with novel properties and development ofπ-conjugated molecules as next-generation functional materials are actively conducted.Contents in this lecture are the structure and physical properties of π-conjugated molecules and photochemical reactions. The latest research topics are also explained.		
Goal of the Subject	Students will be able to understand the synthesis, structure, and properties ofπ-conjugated system. Through these understandings, they will get advanced knowledge necessary for designing and developing π-conjugated organic molecules with excellent properties.		
Contents of the Subject /Subject Plan	Lectures regarding the following topics will be provided.1, Electronic Structure (Molecular Distortion and Aromaticity) 2, Unique π-conjugated molecule I (Cycloparaphenylene and Fullerene) 3, Unique π-conjugated molecule II (Coronene and Sumanen) 4, Function of π-conjugated molecule I (charge transfer complex and conductive molecule) 5, Function of π-conjugated molecule II (organic transistor) 6, Function of π-conjugated molecule III (organic solar cell and organic light-emitting element) 7, Assembles of π-conjugated molecule (supramolecule) 8, Photochemical reaction of π-conjugated molecule		
Preparation and Review	Materials on lecture will be distributed before class. Students should confirm contents and come to class. Additionally, read the relevant papers after the lecture and investigate the latest research results.		
Evaluation Method	Students will be comprehensively evaluated from reports, attendance and attitude in class.		
Comments to Students	This lecture is suitable for students who are interested in π-conjugated organic molecules with unique structure and properties.		
Teaching Materials	none		
Remarks1			
Remarks2			

Subject Code	SM21650011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Creative Advanced Inorganic Chemistry II		
Subject Name(English)	Creative Advanced Inorganic Chemistry II		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Satoshi Shinoda		
Main Theme of the Subject	This course aims to study molecular recognition chemistry which deals with weak interactions between molecules and self-assembly of molecules. Especially, structures and functions of supramolecules formed by non-covalent bonds including coordination bonds of metal ions. Unique coordination and luminescence properties of lanthanide ions and their complexes are focussed.		
Goal of the Subject	The goals of this course are to (1) Understand the processes and analytic methods about the formation of ion and molecular complexes, (2) Be able to design molecules by using characteristic properties of various metal ions, (3) Understand the electronic structures and mechanism of electronic transitions of metal complexes, and (4) Understand the properties of f-electrons and learn about their usages.		
Contents of the Subject /Subject Plan	1. Weak interactions between molecules and principles of molecular recognition 2. Molecular recognition based on coordination chemistry 3. Stereochemistry of metal complexes and supramolecular chemistry 4. Dynamic coordination chemistry and self-assembly 5. Examples of functional metal complexes 6. Characteristics of lanthanide ions and lanthanide coordination chemistry 7. Functions of lanthanide complexes and their applications 8. Recent topics on supramolecular coordination chemistry		
Preparation and Review			
Evaluation Method	class participation including short examinations (40%) submission of reports (60%)		
Comments to Students	This course deals with metal complexes, but mainly focus on general molecular recognition and supramolecular chemistry.In the latter half, lanthanide complexes are used as subjects.		
Teaching Materials	Jonathan W. Steed and Jerry L. Atwood, "Supramolecular chemistry, 2nd Ed.", Wiley Simon Cotton, "Lanthanide and actinide chemistry", Wiley		
Remarks1			
Remarks2			

Subject Code	SM21680011	Offering Academic Year/Semester	2019 Second Semester
Subject Name	Creative Advanced Physical Chemistry II		
Subject Name(English)	Creative Advanced Physical Chemistry II		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Masazumi Fujiwara		
Main Theme of the Subject	Modern optical microscopy is a fundamental research tool to visualize dynamic motion of molecules and nanomaterials at nano/micro-scale, which are widely used in a broad scientific area of physics, chemistry and biology. In this lecture, we study the fundamentals of optics and electromagnetism to understand the principle and functions of optical microscope. We also study the principles and applications of some advanced optical microscope techniques including single-molecule spectroscopy and super-resolution imaging.		
Goal of the Subject	Students understand basics of optics and the principle of optical microscope. They get familiar with a pure-classical methodology to study absorption/emission of molecules, in which the absorption/emission of molecules are treated as optical transmission and interference. They also know some cutting-edge applications of optical microscope.		
Contents of the Subject /Subject Plan	1st Give an overview of the lecture and have a survey to know the level of students.2nd Basics of optics and principles of microscope.3rd Principles of confocal microscope.4th Basics of electromagnetism.5th Pure classical picture of absorption, scattering, and emission of molecules.6th Single molecule (single nanoparticle) spectroscopy.7th Some advanced applications of optical microscopy.		
Preparation and Review	Pre-study the educational material provided from the lecturer. Check the distributed materials (like original papers) after the lecture.		
Evaluation Method	Quality of the final report (50%) and active participation to the class (50 %).		
Comments to Students	Students need to review textbooks of physical chemistry and molecular spectroscopy of undergraduate level.		
Teaching Materials	Related documents and educational materials will be distributed.Reference: Novotony and Hecht, “Principles of Nano-Optics”(Cambridge University Press, 2012)		
Remarks1			
Remarks2			

Subject Code	SM21720011	Offering Academic Year/Semester	2019 Second Semester
Subject Name	Functional Advanced Organic Chemistry II		
Subject Name(English)	Functional Advanced Organic Chemistry II		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Kazuhiko Sakaguchi		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to learn the structure and reactivity of organic molecules from the viewpoint of molecular orbitals, and useful organic synthetic reactions based on them.		
Goal of the Subject	The goals of this course are to Understand "stereoelectronic effects" that determines the shapes and reactivity of organic molecules. Understand the influence of the stereoelectronic effects on the conformation of organic molecules. Understand the influence of the stereoelectronic effects on reactivity and selectivity of organic reactions. Understand various organic reactions based on frontier orbital theory.		
Contents of the Subject /Subject Plan	The lecture will be conducted according to the following contents. Exercises will be also held each time. (1) Effects of molecular orbitals on conformation (2) Effects of molecular orbitals on reactivity of substitutions (3) Effects of molecular orbitals on reactivity of additions and eliminations (4) Effects of molecular orbitals on reactivity of rearrangements and fragmentations (5) Cycloaddition reactions and their application (6) Electrocyclic reactions and their application (7) Sigmatropic rearrangement reactions and their application (8) Exercises and its commentary		
Preparation and Review	Students are required to review the contents of lectures and exercises carefully. Students are also required to submit a report (the task of summarizing recent research related to lecture content).		
Evaluation Method	Grading will be based on assessment of exercises (50%), and submitted reports (50%).		
Comments to Students	Students are expected to work on ambitious learning.		
Teaching Materials	The teacher will distribute teaching materials according to lecture contents at each time.		
Remarks1			
Remarks2			

Subject Code	SM21780011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Functional Advanced Physical Chemistry II		
Subject Name(English)	Functional Advanced Physical Chemistry II		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Daisuke Shiomi		
Main Theme of the Subject	To understand the interaction of electromagnetic waves and matters on the basis of quantum mechanics, quantum chemistry, and statistical mechanics. Rich varieties of spectroscopy and diffractometry are based on the interaction. The electromagnetic wave-matter interaction and magnetism in a solid state are surveyed.		
Goal of the Subject	The methodology of several spectroscopic and diffractometric studies should be understood with application to electric and magnetic properties of crystalline materials. Exotic magnetic materials and metamaterials are studied as examples of material-oriented applications.		
Contents of the Subject /Subject Plan	1. Overviewing the methodology of several spectroscopic and diffractometric studies 2. Quantum mechanics and electromagnetism underlying spectroscopy and diffractometry 3. Maxwell's equations 4. Magnetic resonance spectroscopy 5. Generalized constitutional equations 6. Methodologies for magnetic properties of structurally engineered materials 7. Magneto-optical effects in magnets 8. Recent topics in metamaterials		
Preparation and Review	Preparation and review are recommended using research articles of the topics as specified in the lecture.		
Evaluation Method	Exercises (30%) and reports (70%)		
Comments to Students	Review of physical chemistry in the undergraduate course (statistical thermodynamics and quantum chemistry) is recommended.		
Teaching Materials	Handout materials including recent research articles		
Remarks1			
Remarks2			

Subject Code	SM21800011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Functional Advanced Molecular Science		
Subject Name(English)	Functional Advanced Molecular Science		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Ikuko Miyahara		
Main Theme of the Subject	X-ray crystallography is a powerful tool in the elucidation of the three-dimensional structures of small molecules and macromolecules.In this class, general crystallography and several new topics will be lectured.		
Goal of the Subject	To learn the structure determination of small and large molecules using single crystal X-ray crystallography.		
Contents of the Subject /Subject Plan	1 Diffraction of X-rays 2 Crystals, Symmetry, and Space group 3 Phase problem 4 Crystallization and Data collection 5 Refinement of Crystal Structures 6 Derived Results 7 Validation of Crystal structures 8 Current topics in crystallography		
Preparation and Review	After the classes, students study again the lecture note and distributed documents for understanding of the subject.		
Evaluation Method	Reports		
Comments to Students	None		
Teaching Materials	Articles will be distributed when appropriate.		
Remarks1			
Remarks2			

Subject Code	SM21810011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Selected Topics in Creative Organic Chemistry 1		
Subject Name(English)	Selected Topics in Creative Organic Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Takahiro Nishimura		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to deeply understand organic chemistry from the intensive lectures focusing on solid organic chemistry, bioorganic chemistry, synthetic organic chemistry, organometallic chemistry, organic reaction chemistry, and polymer chemistry, which will be provided by the experts in each area.		
Goal of the Subject	The goals of this course will be informed at the beginning of the class.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be announced at the beginning of the class.		
Comments to Students			
Teaching Materials	Teaching materials will be provided at the beginning of the class.		
Remarks1			
Remarks2			

Subject Code	SM21830011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Selected Topics in Creative Inorganic Chemistry 1		
Subject Name(English)	Selected Topics in Creative Inorganic Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Hiroshi Nakajima		
Main Theme of the Subject	The objective of this class is to introduce a wide variety of leading-edge areas related to inorganic chemistry, such as inorganic solids materials, metal complexes, organometallic catalysts and open shell metal clusters associated with emerging spin technologies. Basics and recent progresses of a selected topic will be given by an invited expert of the field. This class is offered as an intensive course.		
Goal of the Subject	Students will acquire knowledge on the leading edge of inorganic chemistry introduced in this class. The application of acquired knowledge to their ongoing research projects are also encouraged.		
Contents of the Subject /Subject Plan	Course contents will be introduced at the beginning of semester.		
Preparation and Review	Lecture materials will be delivered at the beginning of the class. Students are encouraged to review the materials after finishing the class.		
Evaluation Method	Grading will be announced at the beginning of the class.		
Comments to Students	Participate actively to broaden your knowledge on the leading edges in inorganic chemistry.		
Teaching Materials	Lecture materials will be delivered at the beginning of the class.		
Remarks1			
Remarks2			

Subject Code	SM21850011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Selected Topics in Creative Physical Chemistry 1		
Subject Name(English)	Selected Topics in Creative Physical Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Kazunobu Sato		
Main Theme of the Subject	Advanced molecular science and chemical physics/physical chemistry based on the quantum theory provide the underlying knowledge for the understanding of modern materials science and chemistry. This course covers various topics interested in advanced physical chemistry from quantum chemistry to molecular dynamics and spectroscopy. In this course, current topics among the research fields in modern physical chemistry will be focused.		
Goal of the Subject	The goals of this course will be given at the beginning of the class.		
Contents of the Subject /Subject Plan	Course contents will be announced in advance.		
Preparation and Review	Informaton on self-learning will be announced in advance.		
Evaluation Method	Grading will be announced at the beginning of the class.		
Comments to Students			
Teaching Materials	Teaching materials will be given in the class.		
Remarks1			
Remarks2			

Subject Code	SM21870011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Selected Topics in Functional Organic Chemistry 1		
Subject Name(English)	Selected Topics in Functional Organic Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Yoshiki Morimoto		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to understand structural analysis and synthetic methodologies of biofunctional, photoresponsive, and electron transfer materials. This course also deals with modern concepts for the synthesis of functional materials by way of fine chemistry and molecular aggregation.		
Goal of the Subject	The goals of this course will be informed at the beginning of the class.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review	The contents for before and after learning will be provided at the beginning of the class.		
Evaluation Method	Grading will be announced at the beginning of the class.		
Comments to Students	Comments to the students will be announced at the beginning of the class.		
Teaching Materials	Teaching materials will be provided in the class.		
Remarks1			
Remarks2			

Subject Code	SM21890011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Selected Topics in Functional Inorganic Chemistry 1		
Subject Name(English)	Selected Topics in Functional Inorganic Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Toshiyuki Moriuchi		
Main Theme of the Subject	This class focuses on inorganic functional materials which have been rapidly developing recent years. Fundamental concepts and recent progress in the field of life sciences and materials sciences will be discussed. Lectures of this intensive course will be given by specialists.		
Goal of the Subject	Students will learn the fundamental concept and knowledge of redox properties, assembling properties, biophysical function, chirality organization, structural control, and coordination programming for the design of functional inorganic chemistry.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review	Course contents will be provided at the beginning of the class.		
Evaluation Method	Grading will be announced at the beginning of the class.		
Comments to Students	We would like you to expand your perspective by actively participating.		
Teaching Materials	Teaching materials will be provided in the class.		
Remarks1			
Remarks2			

Subject Code	SM21910011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Selected Topics in Functional Physical Chemistry 1		
Subject Name(English)	Selected Topics in Functional Physical Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Harukazu Yoshino		
Main Theme of the Subject	This is a seminar given by an invited researcher, who is studying functional molecules and/or their condensed states at the frontier of Physical Chemistry and related fields. The topics and its details will be announced separately since they change every year depending on the lecturer.		
Goal of the Subject	It is getting more and more important to organize various physical and chemical methods of measurements, calculations, and theories to characterize novel functional molecules and their condensed states. In this seminar, the students are expected to learn the expertise in Physical Chemistry and related fields to understand recent studies on the functional materials.		
Contents of the Subject /Subject Plan	To be announced separately.		
Preparation and Review	To be announced separately.		
Evaluation Method	To be announced separately.		
Comments to Students	This seminar is given by a leading expert in Physical Chemistry and related fields. Different lecturers have been providing their original topics every year. Students are expected to learn not only the recent results on their studies and basic knowledge to understand them, but also to find how the researchers are facing and solving their problems. Thus, the students should be enthusiastic about asking questions as well as participating in discussion at and out the class.		
Teaching Materials	To be announced separately.		
Remarks1			
Remarks2			

Subject Code	SM21950011	Offering Academic Year/Semester	2019 Second Semester
Subject Name	Selected Topics in Integrated Molecular Chemistry 1		
Subject Name(English)	Selected Topics in Integrated Molecular Chemistry 1		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Tomoyuki Yatsuhashi		
Main Theme of the Subject	to be contacted at appropriate occasion		
Goal of the Subject	Recent topics on integrated molecular chemistry are lectured as intensive lectures by experts from other universities.		
Contents of the Subject /Subject Plan	to be contacted at appropriate occasion		
Preparation and Review	to be contacted at appropriate occasion		
Evaluation Method	to be contacted at appropriate occasion		
Comments to Students	to be contacted at appropriate occasion		
Teaching Materials	to be contacted at appropriate occasion		
Remarks1			
Remarks2			

Subject Code	SM21980011	Offering Academic Year/Semester	2019 First Semester
Subject Name	Functional Advanced Biophysical Chemistry II		
Subject Name(English)	Functional Advanced Biophysical Chemistry II		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Ritsuko Fujii		
Main Theme of the Subject	Photosynthesis is the only system that conducts chemical reactions using sunlight, which is the only external force coming to the earth. Photosynthetic pigments, which are organic compounds having relatively simple structures, are immobilized in proteins to perform various photochemical reactions such as light-harvesting / excess-energy quenching / photoelectric conversion reaction. In this lecture,we will focus on the photosynthetic pigment-protein-complexes and understand how the optical properties of photosynthetic pigments undergo individual modulations from the protein environments and achieve excitation energy transfer in the primary reactions of photosynthesis.		
Goal of the Subject	(1) Understand the outline of the primary reactions of photosynthesis. (2) Understand examples of proposed mechanisms of the excitation energy transfer by using a combination of actual measurement and theory with respect to the structure, electronic state, photoresponse of photosynthetic pigment. (3) Through these, understand what it means to elucidate the mechanism of excitation energy transfer.		
Contents of the Subject /Subject Plan	1) Sunlight and Photosynthesis 2) Structure of photosynthetic pigments in the pigment-protein complex 3) Structure and Electronic Excited States of Carotenoids 4)Structure and Electronic Excited States of Chlorophyll 5) Photoelectric photo conversion reaction in photosynthetic reaction center 6) Excitation energy transfer in the unoxygenic photosynthetic light-harvesting complex 7) Excitation energy transfer between the pigment-protein complexes 8) Regulation of Excitation energies in the oxygenic photosynthetic light-harvesting complex.		
Preparation and Review	The outline will be explained in the first lesson. The basics of photochemistry should be understood beforehand. Study some of the original manuscripts mentioned in the classes are recommended as an ex-post learning.		
Evaluation Method	Evaluate by report.		
Comments to Students	Lecture will be mainly based on the researches done by the instructor in charge of this class.I also welcome students from different fields.		
Teaching Materials	Documents of lesson are distributed every time. Reference books will be introduced in the first lesson or handouts.		
Remarks1			
Remarks2			

Subject Code	SM23110011	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	International Seminar		
Subject Name(English)	International Seminar		
Subject Number	SBISE1501		
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to develop world-class talent through international lectures in English provided by the overseas researchers.		
Goal of the Subject	The goal of this course is to develop communication ability in English useful for succeeding in international activities.		
Contents of the Subject /Subject Plan	Students are required to attend international lectures assigned as International Seminar four times or more and to pass an exam.		
Preparation and Review			
Evaluation Method	Grading will be based on reports and assessment of performance in the seminar.		
Comments to Students			
Teaching Materials	Teaching materials will be provided in the class.		
Remarks1			
Remarks2			

Subject Code	SM23140011	Offering Academic Year/Semester	2019 Second Semester
Subject Name	Functional Advanced Inorganic Chemistry II		
Subject Name(English)	Functional Advanced Inorganic Chemistry II		
Subject Number			
Credits	1 Credit	Teaching Method	Lecture
Main Lecturer	Yasuyuki Tsuboi		
Main Theme of the Subject	1. Fundamentals of electronic devices 2. Fundamentals of photonic devices 3. Fundamentals of nanotechnology 4. Applications of these technologies and sciences 5. Future scope		
Goal of the Subject	Deep understandings of the topics 1-5.		
Contents of the Subject /Subject Plan	1, Nanotechnology, a definition 2. Ancient History of Nanotech. 3. Modern history of nanotech. 4. Moore's Law 5. Technology Shifts 6. Commercialization 7. Nano-Materials 8. Nano-photonics 9. Nano-biology 10. Nano-devices		
Preparation and Review	recommended		
Evaluation Method	Reports and test		
Comments to Students			
Teaching Materials	It will be supplied in lectures.		
Remarks1			
Remarks2			

Subject Code	SM24130013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Exercises in Creative Molecular Science		
Subject Name(English)	Exercises in Creative Molecular Science		
Subject Number	SBCMS1503		
Credits	4 Credits	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to review and introduce current research articles in the field of creative molecular science to gain an overview of developments in this field. Students will also report on progress of individual research projects and discuss it with supervisors and the group members.		
Goal of the Subject	The goals of this course are to (1) Gain a deeper understanding of creative molecular science.(2) Obtain broad expertise and leading-edge research methods of molecular construction by solving problem sets, experimental training, and reviewing research articles.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be based on lab reports and assessment of performance in the seminar.		
Comments to Students			
Teaching Materials	Teaching materials will be introduced in the class.		
Remarks1			
Remarks2			

Subject Code	SM24140013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Exercises in Creative Molecular Science		
Subject Name(English)	Exercises in Creative Molecular Science		
Subject Number	SBCMS1601		
Credits	4 Credits	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to review and introduce current research articles in the field of creative molecular science to gain an overview of developments in this field. Students will also report on progress of individual research projects and discuss it with supervisors and the group members.		
Goal of the Subject	The goals of this course are to (1) Gain a deeper understanding of creative molecular science.(2) Obtain broad expertise and leading-edge research methods of molecular construction by solving problem sets, experimental training, and reviewing research articles.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be based on lab reports and assessment of performance in the seminar.		
Comments to Students			
Teaching Materials	Teaching materials will be introduced in the class.		
Remarks1			
Remarks2			

Subject Code	SM24150013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Exercises in Functional Molecular Science		
Subject Name(English)	Exercises in Functional Molecular Science		
Subject Number	SBFMS1503		
Credits	4 Credits	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to review and introduce current research articles in the field of functional molecular science to gain an overview of developments in this field. Students will also report on progress of individual research projects and discuss it with their supervisors and the group members.		
Goal of the Subject	The goals of this course are to (1) Gain a deeper understanding of functional molecular science.(2) Acquire broad knowledge and leading-edge research methods of functional molecules by solving problem sets, experimental training, and reviewing research articles.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be based on lab reports and assessment of performance in the seminar.		
Comments to Students			
Teaching Materials	Teaching materials will be introduced in the class.		
Remarks1			
Remarks2			

Subject Code	SM24160013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Exercises in Functional Molecular Science		
Subject Name(English)	Exercises in Functional Molecular Science		
Subject Number	SBFMS1601		
Credits	4 Credits	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to review and introduce current research articles in the field of functional molecular science to gain an overview of developments in this field. Students will also report on progress of individual research projects and discuss it with their supervisors and the group members.		
Goal of the Subject	The goals of this course are to (1) Gain a deeper understanding of functional molecular science.(2) Acquire broad knowledge and leading-edge research methods of functional molecules by solving problem sets, experimental training, and reviewing research articles.		
Contents of the Subject /Subject Plan	Course contents will be provided at the beginning of the class.		
Preparation and Review			
Evaluation Method	Grading will be based on lab reports and assessment of performance in the seminar.		
Comments to Students			
Teaching Materials	Teaching materials will be informed at the beginning of the class.		
Remarks1			
Remarks2			

Subject Code	SM24170013	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	Advanced Research Course for Master's Thesis of Chemistry I		
Subject Name(English)	Advanced Research Course for Master's Thesis of Chemistry I		
Subject Number	SBARC1501		
Credits	6 Credits	Teaching Method	Seminar／Laboratory
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to help students acquire depth knowledge of the research process and skills for the design and conduct of advanced chemistry experiments on the basis of knowledge and experimental skills taken through an undergraduate course.		
Goal of the Subject	The goals of this course are to Obtain the knowledge and skills to conduct experiments in a safe and scientific manner.Gain the skills and knowledge to conduct advanced chemistry researchAcquire communication and discussion skills in English by disseminating research findings to the world.Obtain the ability to utilize knowledge, to solve problems, and to set original research projects.		
Contents of the Subject /Subject Plan	Students will select one of the following labs and do chemical research provided by a supervisor in each lab. Field of Physical Chemistry: Quantum Functionality Materials, Molecular Physical Chemistry, Photophysical Chemistry, Biophysical Chemistry Field of Organic Chemistry: Synthetic Organic Chemistry, Molecular Conversion, Physical Organic Chemistry, Organic Reaction Chemistry, Fine Organic Chemistry Field of Inorganic Chemistry: Advanced Analytical Chemistry, Bio-functional Molecular Design, Hybrid Molecular Chemistry, Function Chemistry Students are expected to (1) Set experimental plans on the basis of the research projects provided by their supervisors.(2) Be able to understand the experimental results and to report them in a straightforward manner. Students will also be able to modify the experimental plans through discussion with supervisors and the lab's member.(3) Understand the background and significance of the research projects by online information retrieval. Students will also be able to extend the research project.(4) Take part in seminars, lecture meetings, and conferences, and be able to review the current research trends logically.(5) Be able to summarize the research results and present them at domestic and international meetings. Students are encouraged to publish articles in academic journals.(6) Be able to use reagents and experimental instruments safely.		
Preparation and Review	Students will obtain the knowledge and methods for experiments by literature research in advance. On the basis of the information, students are encouraged to plan experimental procedures and discuss them with their supervisors. The obtained experimental results will be constantly reported to the supervisors and applied to the future studies. Students are required to discuss the accumulated experimental results in a research meeting held in each lab. It is highly recommended to obtain experimental skills through a series of before-and-after surveys made in day-to-day studies.		
Evaluation Method	Grading will be based on assessment of an approach and performance to the research subjects, and publishing capability of the studies.		
Comments to Students			
Teaching Materials	Students are required to use specialized books and academic journals, which are selected by themselves, supervisors, and lab's members.		
Remarks1			
Remarks2			

Subject Code	SM40010033	Offering Academic Year/Semester	2019 First Semester, 2019 Second Semester
Subject Name	International Advanced Research Coursefor Master's Thesis of Science 1		
Subject Name(English)	International Advanced Research Coursefor Master's Thesis of Science 1		
Subject Number			
Credits	1 Credit	Teaching Method	Seminar
Main Lecturer	Masatoshi Kozaki		
Main Theme of the Subject	The aim of this course is to provide an opportunity for students to gain research experience abroad.		
Goal of the Subject	The goals of this course are to (1) Develop and achieve a dissertation research project of the master's course by the research experience abroad.(2) Join the scientific community of overseas students and researchers in the research field.		
Contents of the Subject /Subject Plan	Students will be advised about how to select the overseas university and research institute, how to plan a research project and experimental procedures, how to present the research results in English. Students are required to provide the research reports.		
Preparation and Review			
Evaluation Method	Grading will be based on assessment of the research progress and results. Your grade will also be decided based on the presentation and communication skills abroad.		
Comments to Students	Before registration of the course, students should be approved by their supervisors.		
Teaching Materials			
Remarks1			
Remarks2			