Subject Code	SM31030011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Microbiological Chemistry I		
Subject Number	SCB011502		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Ken-ichi Fujita,Akira Ogita		
Main Theme of the Subject	This course focuses on primary metabolism intrinsically possessed by all organisms and secondary metabolism, unique and developed in a kind of microorganisms. Furthermore, in a variety of secondary metabolism, students will understand diversity in bioacti		
Goal of the Subject	Students are expected to gain a fundamental understanding of secondary metabolism, nonessential for vegetative growth in microorganisms. In addition, they must positively participate in specific discussion related to the wide variety of biological activit		
Contents of the Subject /Subject Plan	1. Introduction 2. Primary metabolism 3. Secondary metabolism 4. Outline on actinomycetes 5. Bioactive substances 6. Screening of bioactive substances 7. Purification and structural determination of bioactive substances 8. Antibiotics 9. Antifungal antibiotics 10. Drug resistance 11. Immunity and allergy 12. Immunomodulative bioactive substances 13. Cytoskeleton-targeting bioactive substances 14. Drug resistance-targeting bioactive substances 15. Review of this course		
Preparation and Review	Before lecture: We highly recommend to prepare each lecture by reading recent articles and reviews related to the topics. After lecture: We recommend to review the key points and the meanings of the technical terms that the students have learned in the c		
Evaluation Method	Your final grade in the class will be decided based on the usual performance score in class.		
Comments to Students	The students are actively expected to participate in discussion.		
Teaching Materials	Antimicrobial agents -Antibacterials and antifungals- Ed. by Andre Bryskier ASM press.		
Remarks1			

Subject Code	SM31040011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Microbiological Chemistry II		
Subject Number	SCB011503		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Yoshihiro Yamaguchi,Akira Ogita		
Main Theme of the Subject	This course focuses on the physiological functions of bioactive substances containing protein, antibiotics, and biopolymer. Lectures will cover the fundamentals of the mechanism of action of toxic proteins and antibiotics as well as the physiological role		
Goal of the Subject	Students are expected to gain a fundamental understanding of bioactive substances containing proteins and secondary metabolism products, and the relationship between structure and function of these substances produced with microbes. After completion of th		
Contents of the Subject /Subject Plan	1 Bioactive substances causing membrane damage (1) 2 Bioactive substances causing membrane damage (2) 3 Bioactive substances interrupting cytoskeletal proteins(1) 4 Bioactive substances interrupting cytoskeletal proteins(2) 5 Bioactive substances inhibiting protein synthesis(1) 6 Bioactive substances inhibiting protein synthesis(2) 7 Bioactive substances inhibiting protein synthesis(3) 8 Bioactive substances inhibiting DNA replication 9 Bioactive substances inhibiting RNA synthesis(1) 10 Bioactive substances inhibiting RNA synthesis(2) 11 Structure and function of biopolymers(1) 12 Structure and function of biopolymers(2) 13 Application of biopolymers 14 Seminar and/or factory tour 15 Review of this course		
Preparation and Review	Students are expected to understand the meanings of handouts distributed. They are expected to prepare adequate answers for questions areised during presentations in seminar within next week.		
Evaluation Method	Your final grade in the class will be decided based on the usual performance score in class.		
Comments to Students	Students are actively expected to participate in preparetion of document for presentation, actual presentation, and questions and answers-session.		
Teaching Materials	Handouts in addition to graduation theses and theses for master and doctoral degree previously approved in the laboratory and their related articles.		
Remarks1	Students are expected to prepare handouts based on previously published literatures and own experimental results.		

Subject Code	SM31050011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Enzyme Chemistry		
Subject Number	SCB011504		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Kazuo Ito		
Main Theme of the Subject	Explanation of substrate specificity of enzyme, coenzyme, enzyme kinetics, enzyme inhibitor, multiple form of enzyme and the relation between structure and catalitic function of enzyme. Explanation of glycoenzymes such as amylases and enzymes responsible		
Goal of the Subject	Understanding of basic properties of sutructure and function of enzymes essential for bioreactions. Understanding of carbohydrate and glycoconjutaes indispensable for biorecogniton, bioenergy and biosturcture. Understanding of application of enzymes for p		
Contents of the Subject /Subject Plan	1, General property of enzyme 2, Action mode of enzyme 3, Catalytic mechanism of enzyme 4, Catalytic mode of enzyme 5, Structure of enzyme 6, Specificity of enzyme 7, Expression of enzyme activity 8, Multiple form of enzyme 9, Regulation of enzyme activity 10, Enzymatic analysis 11, Enzymatic production of useful substance 12, Enzymatic synthesis of fucntional oligosaccharide and polysaccharide 13, Structure and function of oligosaccharide and polysaccharide synthesized by enzyme 14, Enzyme system responsible for biosynthesis of glycoconjugate 15, Enzyme system responsible for catabolism of glycoconjugate		
Preparation and Review	Preparation of lecture content using textbook. Understanding lecture contents and related articles by self-study using reference documents		
Evaluation Method	Attendance and repoprt		
Comments to Students	Guide separately		
Teaching Materials	Enzyme Chemistry and Molecular Biology of Amylases and Related Enzymes(CRC Press) Introduction to Glycobiology(Oxford University Press)		
Remarks1			

Subject Code	SM31070011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Selected Topics in Sciences of Biomolecules I		
Subject Number	SCB011507		
Credit(s)	1 Credit	Teaching Method	Lecture
Lecturer(s)	Ken-ichi Fujita		
Main Theme of the Subject	A lecture on current topics in sciences of biomolecules by an expert from outside the university.		
Goal of the Subject	Students will deepen their knowledge on sciences of biomolecules.		
Contents of the Subject /Subject Plan	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Preparation and Review	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Evaluation Method	By class attendance and report submission.		
Comments to Students	To be announced separately.		
Teaching Materials	To be announced separately.		
Remarks1			

Subject Code	SM31100011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Biology of Plant Functions I		
Subject Number	SCB021501		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Kouichi Soga		
Main Theme of the Subject	This course deals with what structure plant hormones have, how they are synthesized and broken down, how they are transported, how their signals are transduced, and what physiological functions they have.		
Goal of the Subject	Students should be enabled to develop knowledge and understanding of the structure and the function of plant hormones, which have important roles in regulation of the life cycle and responses to environmental stimuli in plants.		
Contents of the Subject /Subject Plan	1. Introduction: What is plant hormone? 2. History of discovery and research of plant hormones 3. Type and structure of plant hormones 4. Synthesis of plant hormones 5. Metabolisms of plant hormones 6. Transport of plant hormones 7. Physiological functions of plant hormones: Regulation of germination and vegetative growth 8. Physiological functions of plant hormones: Regulation of reproductive growth and senescence 9. Physiological functions of plant hormones: Responses to light and gravity 10. Physiological functions of plant hormones: Responses to temperature and water 11. Action mechanisms of plant hormones 12. Receptors of plant hormones 13. Signal transduction of plant hormones 14. Interaction between plant hormones 15. Utilization of plant hormones		
Preparation and Review	Students are expected to study the provided handouts, and look up unknown terms in the reference book before the class. In addition, the unclear point about the lecture contents should be clarified by questions in the class and using reference book after		
Evaluation Method	Grading will be decided based on performance of questions and answers in the class, and understanding levels (100%).		
Comments to Students	Will be introduced in the class.		
Teaching Materials	Handouts are provided. Reference book: Plant Physiology and Development (Sinauer Associates) ISBN: 978-1605353265		
Remarks1			

Subject Code	SM31110011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Biology of Plant Functions II		
Subject Number	SCB021502		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Kazuyuki Wakabayashi		
Main Theme of the Subject	The cell wall provides protoplasts with the structural (mechanical) rigidity and determines directly the size and shape of plant cells. Thus, the cell wall plays an important role in the regulation of growth and morphogenesis in plants. Plant cell wall is		
Goal of the Subject	The objective is to obtain basic knowledge on plant cell walls. Also, students are expected to deepen their understanding on plant growth and morphogenesis.		
Contents of the Subject /Subject Plan	1. Introduction 2. Structure of plant cell wall 3-7. Constituents of plant cell wall (monosaccharides, matrix polysaccharides, cellulose, phenolic substances, cell wall proteins) 8-12. Metabolism of plant cell wall (synthesis of polysaccharides and phenolic substances, breakdown of polysaccharides, transglycosylation of matrix polysaccharides) 13-15. Function of plant cell wall (regulation of growth, morphogenesis, and defense in plants)		
Preparation and Review	Students are strongly recommended review of the contents of lecture to deepen their knowledge and understanding.		
Evaluation Method	By class attendance and report submission.		
Comments to Students	Will be introduced in the class.		
Teaching Materials	Reference book: Plant Physiology and Development 6th edition, Taiz L, Zeiger E, et al. eds. Handouts are provided.		
Remarks1			

Subject Code	SM31120011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Animal Development I		
Subject Number	SCB021503		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Tohru Komiya		
Main Theme of the Subject	Some studies using morphological and cytochemical features and studies on germ cell formation based on the latest specific gene expression as an index are presented with examples of several animal species.		
Goal of the Subject	We explain that the animal's germ cell formation mechanism can be classified into determinant type and induced type from invertebrates to vertebrates.		
Contents of the Subject /Subject Plan	1st. Two modes of germ cell formation in animal 2nd. The germ cell formation of planaria 3rd. The germ cell formation of nematode 4th. The germ cell formation of Drosophila 5th. The germ cell formation of zebrafish 6th. Outline of germ cell formation process of the anuran amphibians 7th. Molecular mechanism of germline formation in the anuran amphibian 8th. The germ cell formation of the urodelan amphibian 9th. The germ cell formation of avian (chicken) 10th. Mammalian germ cell formation 11th. Outline explanation of the genes working on germ cell formation 12th. The detail Explanation of the genes working on germ cell formation at the molecular level 13~15th. Students are required to summarize opinions of each of the lectured themes, and to make presentations and express their opinions.		
Preparation and Review	Since I distribute prints, students review the preliminary examination in advance.		
Evaluation Method	We will decide on the evaluation of each presentation and grading of the report, test etc.		
Comments to Students	I hope to study voluntarily.		
Teaching Materials	Reference ;「Primordial Germ Cells in the Chordates」 by Nieuwkoop P. D. & Sutasurya L. A. (Cambridge University Press)		
Remarks1			

Subject Code	SM31130011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Animal Development II		
Subject Number	SCB021504		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Tohru Komiya		
Main Theme of the Subject	The process of development that progressively complicates with progress is to be carried out by the interaction between the DNA which is a gene and the protein formed based on the directive. Also, I would like to explain the problem of diversity on how co		
Goal of the Subject	I consider the occurrence as a network of gene expression, explain from the viewpoint of DNA which is a storage of genetic information and protein interaction, and also explain the relationship with various signal transductions. As a result, it is the goa		
Contents of the Subject /Subject Plan	It was estimated that mammalian genes including humans will be around 100,000. However, as a result of the genome project, it turned out that there were only 20,00. Drosophila and nematode genes are approximately 18,000. Why is a complex life phenomenon involving development occurring in a small number of genes? Discuss the cause of diversity. 1st～3rd. Explain the interaction between the genes and proteins (mainly transcription factors). 4th. Outline explanation on causes causing diversity. Each theme is explained below. 5th. Diversity in transcription level. 6th. Diversity in translation level. 7th. Diversity at the post-translational level. 8th. Combination and Diversity of Proteins in Multimerization. 9th. Cross talk and diversity of signaling. 10th. The explanation that the same gene is repeatedly used in various occurrence phenomena. 11th. The mechanism of generation of diversity in immunity. 12th~15th. Summarize the lectured themes, members make presentations and express their opinions. This will deepen the understanding of occurrence phenomena and genetic linkage.		
Preparation and Review	Since we distribute prints, we will conduct a preliminary review after advance.		
Evaluation Method	I will decide on the evaluation of each presentation and grading of report and test.		
Comments to Students	Since you are graduate students, I hope to voluntarily pursue research.		
Teaching Materials	The Regulatory Genome:Gene Regulatory Networks in Development and Evolution (Academic Press)		
Remarks1			

Subject Code	SM31140011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Molecular Cell Biology I		
Subject Number	SCB021505		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Taro Nakamura		
Main Theme of the Subject	This course aims to provide fundamental properties of cellular functions such as proliferation and differentiation on the molecular level. The main topics are how yeasts that can use molecular genetics method has helped understanding eukaryotic cells as a		
Goal of the Subject	The aim of this course is to understand the history, outcomes, and latest researches of yeasts, which has greatly contributed to the elucidation of the fundamental properties of cellular functions such as cell proliferation and differentiation.		
Contents of the Subject /Subject Plan	I. Yeasts as a model organism history II. Yeasts as a model organism gene manipulation III. Classification, ecology and evolution of yeast IV. Application of yeast study V. Latest yeast studies budding yeast and cell cycle VI. Latest yeast studies fission yeast and cell cycle VII. Latest yeast studies checkpoint VIII. Latest yeast studies chromatin structure IX. Latest yeast studies transcriptional regulation X. Latest yeast studies translation XI. Latest yeast studies cell wall XII. Latest yeast studies sexual differentiation XIII. Latest yeast studies genome editing XIV. Latest yeast studies bioinformatics XV. Latest yeast studies autophagy		
Preparation and Review	Self-review is strongly recommended after each lecture.		
Evaluation Method	Evaluation is based on class participation, assignment and discuission.		
Comments to Students	It is recommended to read at least three papers about yeast studies.		
Teaching Materials	Richard Egel: The Molecular Biology of Schizosaccharomyces pombe. Springer, 2004		
Remarks1			

Subject Code	SM31150011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Molecular Cell Biology II		
Subject Number	SCB021506		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Makoto Miyata		
Main Theme of the Subject	Learn mainly in seminar style about the knowledge, technology, viewpoint, discussion, presentation, society, evaluation of research, etc. necessary for research on cell biology, and understand the actuality of biological research. The achievements will be		
Goal of the Subject	Acquire the abilities to conduct research in cell biology and its surrounding fields, for example academic presentations, discussion in scientific meetings, preparation of papers, preparation of application forms, etc.		
Contents of the Subject /Subject Plan	1. Overview of motility study 2. Translation and discussion on video lecture iBiology 3. Introduction of latest papers 4. Practice for academic presentation 5. Introduction of students' research contents 6. Seminar by researchers outside the university 7. Translation and discussion on video lecture iBiology 8. Introduction of latest papers 9. Practice for academic presentation 10. Introduction of students' research contents 11. Seminar by researchers outside the university 12. Translation and discussion on video lecture iBiology 13. Introduction of latest papers 14. Practice for graduation research presentation		
Preparation and Review	Lectures are mainly conducted in seminar style. Make thorough preparations.		
Evaluation Method	Attendance, questions, reports.		
Comments to Students	Active discussion is expected.		
Teaching Materials	Albert B. et al.,“Molecular Biology of the Cell 5th ed.”(Gerland Science)		
Remarks1			

Subject Code	SM31160011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Selected Topics in Sciences of Molecular Biofunctions I		
Subject Number	SCB021507		
Credit(s)	1 Credit	Teaching Method	Lecture
Lecturer(s)	Kouichi Soga		
Main Theme of the Subject	A lecture on current topics in sciences of molecular biofunctions by an expert from outside the university.		
Goal of the Subject	Students will deepen their knowledge on sciences of molecular biofunctions.		
Contents of the Subject /Subject Plan	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Preparation and Review	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Evaluation Method	By class attendance and report submission.		
Comments to Students	To be announced separately.		
Teaching Materials	To be announced separately.		
Remarks1			

Subject Code	SM31190011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Functional Ecology		
Subject Number	SCB031501		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Akira Itoh		
Main Theme of the Subject	This course explains fundamental ecological concepts related to biodiversity. It also enhances the basic techniques necessary for conducting ecological researches, e.g., document reading, research planning, field and lab experiment, data analysis, paper w		
Goal of the Subject	After completing this course, you should be able to understand the basic concepts of genetics, evolution, and ecology as well as to read scientific papers in these fields. You should also be able to understand and use basic skills for ecological study.		
Contents of the Subject /Subject Plan	1. Ecology and biodiversity 2. Genetic diversity 1: basics of population genetics 3. Genetic diversity 2: methods in study of genetic diversity 4. Species diversity 1: pattern and process of speciation 5. Species diversity 2: methods in study of species diversity 6. Phylogenetic diversity 1: concept of phylogenetic diversity 7. Phylogenetic diversity 2: methods in study of phylogenetic diversity 8. How to collect and organize scientific information 9. How to make study plan 10. Methods of data analysis 1: basics of statistics 11. Methods of data analysis 2: examples of methods 12. How to summarize the results 13. Basics of scientific writing 14. Basics of presentation		
Preparation and Review	You will need to read all the assignments and check your question before the class. After each class, you should summarize lectures and read related papers. You may need to make a presentation about the summary later. In the class of basic skills, you wil		
Evaluation Method	Atitude in class, presentations,and reports.		
Comments to Students	The topic of the lecture may change according to the interest of the students. Students need to bring PCs for statistical analysis using free software "R". If you do not have a PC, please consult in advance.		
Teaching Materials	Books and papers will be introduced during the course.		
Remarks1			

Subject Code	SM31200011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Socio-ecology I		
Subject Number	SCB031502		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Masanori Koda		
Main Theme of the Subject	The process of foramation of the variety of mating systems in vertebrates will be explained based on the natural selection and sexual seletion theories. Sexual dimorphism are also explained. The Evolution of social cognitive ability and social complexity		
Goal of the Subject	Understanding the process and ultimate factors that form the evolution of a variety of mating systems among vertebrates from fish to mammals and primates including humans. The important concepts such as sexual dichromatism, sexual conflicts, sexual roles,		
Contents of the Subject /Subject Plan	The 1st : The introduction of socio-ecology The 2nd: The variation of mating systems among vertebrates The 3rd: Relationships between mating system and sexual dimorphism The 4 and 5th: Sexual selection including mate competition and female mate choice The 6th: Female manipulation or deception of male mating The 7th: male manipulation or deception of female mating The 8 and 9th: Cannibalism and infanticide in lions. The 10 and 11th: Kin selection theories and examples The 12 and 13th: Tit for tat strategy and reciprocal altruism The 14 and 15th: Prosocialily and empathy in human, apes, social mammals and teleost fish		
Preparation and Review	To be announced separately.		
Evaluation Method	Small test at the end of each lecture.		
Comments to Students	It is better to attend the lecture of [Behavioural Ecology] presented under graduate course of Department of biology.		
Teaching Materials	The figures and tables concerning each theme will be distributed,		
Remarks1			

Subject Code	SM31210011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Socio-ecology II		
Subject Number	SCB031503		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Satoshi Awata		
Main Theme of the Subject	The main aim of this course is to help students acquire the necessary study skills and knowledge on sociobiology and behavioral ecology. This course deals with new findings on behavioral ecology. It also enhances the development of students' skills in con		
Goal of the Subject	At the end of the course, participants are expected to explain the essential concepts of several topics on behavioral ecology, to explain how to study in the fields and apply the methods to your study.		
Contents of the Subject /Subject Plan	1. What are sociobiology and behavioral ecology? 2. How to study in the field I: behavioral observation of fishes in the seas and lakes 3. How to study in the field II: behavioral observation of fishes in rivers 4. How to study in the field III: behavioral observation of vertebrates on lands 5. How to study in the field IV: behavioral observation of invertebrates on lands 6. How to conduct field experiments I: fishes in the seas and lakes 7. How to conduct field experiments II: fishes in rivers 8. How to conduct aquarium experiments 9. DNA analyses I: parentage analysis and genetic relatedness 10. DNA analyses II: molecular phylogeny 11. DNA analyses III: phylogenetic comparative methods 12. Hormones and behavior I: reproduction 13. Hormones and behavior: II: stress 14. How to test a hypothesis 15. How to make a project and how to write a scientific paper		
Preparation and Review	The students are expected to read many papers related to your study.		
Evaluation Method	Your final grade will be calculated according to the following process: Attitude in class: 50%; and short reports: 50%.		
Comments to Students	The students are expected to 1) read many papers related to your study; 2) attend all classes and be on time; 3) ask many questions when participating in seminars.		
Teaching Materials	Study-aid books 1. An Introduction to Behavioural Ecology, 2012, N. B. Davies, J. R. Krebs (eds), Wiley-Blackwell 2. Animal Behavior , 2013, Alcock, J., Sinauer Associates, Inc. Publishers		
Remarks1			

Subject Code	SM31220011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Information Biology I		
Subject Number	SCB031505		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Shinsuke Goto		
Main Theme of the Subject	The environments surrounding organisms are very diverse and fluctuate greatly. Some of such environments are not suitable for organisms, and thus, they have to obtain necessary information from environments, process it and adjust their physiology to adapt		
Goal of the Subject	Students will acquire the basic knowledge on insects and on how such successful animals have adapted to environments. By choosing the topics of interest, reading the relevant parts of the specialized book, understanding them, presenting what you learned,		
Contents of the Subject /Subject Plan	1. Guidance, The importance of insects 2. External anatomy 3. Internal anatomy and physiology 4. Sensory systems and behaviour 5. Reproduction 6. Insect development and life histories 7. Insect systematics 8. Insect biogeography and evolution 9. Ground-dwelling insects 10. Aquatic insects 11. Insects and plants 12. Insect societies 13. Insect predation and parasitism 14. Defense		
Preparation and Review	Students have to be eager for presentation, since I will give you many opportunities for it.		
Evaluation Method	To be announced separately.		
Comments to Students	Students have to attend the first lesson, because how to proceed this class will be given. The order of the content of the lesson may be changed according to students' ability and interest.		
Teaching Materials	To be announced at the first lesson.		
Remarks1			

Subject Code	SM31230011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Information Biology II		
Subject Number	SCB031506		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Taro Fuchikawa		
Main Theme of the Subject	Periodic environmental changes such as day and night, high and low tides and seasons occur on the earth. Such changes have caused many organisms to have internal periodicity in their behaviors and physiological process. The academic field dealing with the		
Goal of the Subject	This course is aimed at acquiring expertise in Chronobiology. Students can choose topics of interest, read the relevant parts of the specialized books, understand them, and present them to other students, so that they acquire the knowledge as researchers		
Contents of the Subject /Subject Plan	1. Guidance 2. Introduction to Chronobiology 3. Environmental cycles 4. Characteristics of biological rhythms 5. Methods to analyse biological rhythms 6. Ultradian rhythm 7. Circadian rhythm 8. Circa-tidal and infradian rhythms 9. Photoperiodism 10. Circa-annual rhythm 11. Neuronal mechanisms of biological clock 12. Molecular mechanisms of biological clock 13. Adaptive significance of biological rhythms 14. Current topics in this field 15. Summary		
Preparation and Review	This course provides several opportunities to present what you learn. You must prepare well for the presentations.		
Evaluation Method	Grade is a measure of the quality of your presentations and participation in the discussion after other's presentations.		
Comments to Students	The order of topics in this course may be happened to be switched. You must attend in the first class in this course.		
Teaching Materials	To be announced in the beginning of the course.		
Remarks1			

Subject Code	SM31250011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Selected Topics in Functional Biology of Natural History I		
Subject Number	SCB031508		
Credit(s)	1 Credit	Teaching Method	Lecture
Lecturer(s)	Akira Itoh		
Main Theme of the Subject	A lecture on current topics in sciences of functional biology of natural history by an expert from outside the university.		
Goal of the Subject	Students will deepen their knowledge on sciences of functional biology of natural history.		
Contents of the Subject /Subject Plan	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Preparation and Review	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Evaluation Method	By class attendance and report submission.		
Comments to Students	To be announced separately.		
Teaching Materials	To be announced separately.		
Remarks1			

Subject Code	SM31310011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Metabolic Physiology		
Subject Number	SCB011501		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Ryoji Masui		
Main Theme of the Subject	The aim of this course is to help students to understand fundamental knowledges of structures and interactions of proteins with their ligands, and major methods to analyze them.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges of structures and functions of proteins (including enzymes) and major methods to analyze them.		
Contents of the Subject /Subject Plan	This course will be divided in 14 chapters as follows: 1. Preparation of proteins: overexpression methods 2. Preparation of proteins: purification methods 3. Primary structure of protein: determination of amino acid sequence 4. Primary structure of protein: posttranslational modification, mass spectrometry 5. Protein conformation: principles of protein folding 6. Protein conformation: determination of 3D structure 7. Interaction of proteins with their ligands: dissociation constant 8. Interaction of proteins with their ligands: principles of spectroscopy 9. Interaction of proteins with their ligands: absorption spectroscopy 10. Interaction of proteins with their ligands: fluorescence spectroscopy 11. Interaction of proteins with their ligands: circular dichroism spectroscopy 12. Interaction of proteins with their ligands: other methods 13. Databases and web tools: sequences 14. Databases and web tools: structures		
Preparation and Review	Students are instructed by a supervisor in the course. Students are highly recommended to read materials ahead of time, and to give oral presentation in class.		
Evaluation Method	Students are evaluated comprehensively based on their learning attitude and the quality of their oral presentation.		
Comments to Students	It is hoped that students will actively ask questions and opinions about the content of the class, with a view to using it for their own research.		
Teaching Materials	Students are instructed by a supervisor in the course.		
Remarks1	Inquiry by email is possible at any time (rmasui[at]sci.osaka-cu.ac.jp).		

Subject Code	SM31320011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Biology of Functional ProteinsI		
Subject Number	SCB011505		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Mitsumasa Koyanagi		
Main Theme of the Subject	This course introduces the functional and evolutionary diversities of proteins and their physiological relevance to students taking this course by focusing photoreceptor proteins, which underlie animal photoreception including vision.		
Goal of the Subject	The goals of this course are to 1) understand the functional analysis of protein, 2) understand the relationships between molecular properties of proteins and the evolution of physiological functions, and also 3) be able to discuss on those issues based o		
Contents of the Subject /Subject Plan	1) History of the photoreceptor protein research 2) Molecular properties of photoreceptor proteins 3) Functional analyses of photoreceptor proteins (molecular level) 4) Functional analyses of photoreceptor proteins (cellular level) 5) Functional analyses of photoreceptor proteins (physiological level) 6) Introduction of molecular evolution of photoreceptor proteins 7) Molecular evolution of photoreceptor proteins in vertebrates 8) Molecular evolution of photoreceptor proteins in invertebrates 9) Other proteins involving photoreception 10) Phototransduction machanisms 11) Diversity of photoreceptive system 12) Evolution of photoreceptive system 13) Application of photoreceptor proteins: Optogenetics 14) Cutting edge of the photoreceptor protein research 15) Review		
Preparation and Review	It is highly recommended to prepare each lecture by reading the handouts and to review the contents of lecture for about 1 hour.		
Evaluation Method	Evaluation will be based on oral presentaion and discussion during lectures		
Comments to Students	There might be a change in the order of lecture contents depending on students' comprehension.		
Teaching Materials	Handouts will be distributed.		
Remarks1	The students should attend the first class, in which I will explain the details of lecture contents.		

Subject Code	SM31330011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Biology of Functional ProteinsII		
Subject Number	SCB011506		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Akihisa Terakita		
Main Theme of the Subject	This course introduces the functional and structural diversities of receptor proteins including animal photoreceptor proteins, rhodopsins and the relationship between their molecular properties and biological functions.		
Goal of the Subject	The goals of this course are to 1) understand how receptor proteins capture signals and drive signal transduction cascades, 2) understand the relationships between molecular properties of proteins and biological functions, and also 3) be able to discuss o		
Contents of the Subject /Subject Plan	1) Proteins interaction and the basic knowledge about signal transdaction cascades 2) Diverstity of receptor proteins and signal transduction-related proteins. 3) Biochemistry and molecular physiology of receptor proteins 4) Structure and biophysics of receptor proteins 5) Molecular physiology of signal transduction pathway 6) Mutational analyses of signal transduction cascades 7) Diversity of rhodopsins and their photoreactions and signaling 8) Diversity of rhodopsins and their spectral tuning. 9) Structural changes of rhodopsins and G proteins-coupled receptors (GPCRs) 10) taste and odorant GPCR systems 11) Functional analyses of proteins with animal models 12) Molecular Science of Optogenetics 13) Optogenetic appications of light-sensitive proteins 14) Cutting edge of the photoreceptor protein research 1 15) Cutting edge of the photoreceptor protein research 2		
Preparation and Review	It is highly recommended to prepare each lecture by reading the handouts and to review the contents of lecture for about 1 hour.		
Evaluation Method	Evaluation will be based on oral presentaion and discussion during lectures.		
Comments to Students	There might be a change in the order of lecture contents depending on students' comprehension.		
Teaching Materials	Handouts will be distributed.		
Remarks1	The students should attend the first class, in which I will explain the details of lecture contents.		

Subject Code	SM32010011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Natural History of Anthropogene I		
Subject Number	SCBG11507		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Muneki Mitamura		
Main Theme of the Subject	This lecture gives the introduction on the stratigraphic/geomorphologic change caused by the natural changes and the crustal deformation in the Quaternary, and describe the characteristics and disasters on Quaternary formations.		
Goal of the Subject	This lecture is aimed to undrastand the outline of natural, artificial environmental changes in Quaternary, and natural disasters and environmental problems on Quatenary strata based on the latest result of the Quaternary reseach.		
Contents of the Subject /Subject Plan	1. Quaternary climate change 2. History of animal/plant transition 3. Sea level change 4. Topographic formation 5. Formation of sedimentary basins 6. Formation of Quaternary strata 7. Quaternary crustal deformation 8. Weathering and soil 9. Slope Movement in Quaternary 10. Consolidation characteristics and subsidence 11. Earthquake disasters 12. Groundwater in Quaternary strata 13. Active Fault 14. Environmental problems in Quaternary strata 15. Artificial strata		
Preparation and Review	Please read the reference book etc. for better understanding.		
Evaluation Method	Grade is evaluated in the report.		
Comments to Students	This lecture is planning to go to the related Osaka surrounding area.		
Teaching Materials	The following books will be helpful for this lecture. Quaternary Geology for Scientists and Engeneers: John A. Catt (John Willey & Sons, New York). Sedimentary Basins -Evolution, Facies, and Sediment Budget-: G. Einsele (Springer-Verlag, Berlin). Envir		
Remarks1			

Subject Code	SM32020011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Natural History of Anthropogene II		
Subject Number	SCG011501		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Jun Inoue		
Main Theme of the Subject	The class will introduce reviews of Natural history in Quaternary.		
Goal of the Subject	The Understanding of the natural environment in Quaternary.		
Contents of the Subject /Subject Plan	1. Definition of Quartenary 2. Characteristics of Quaternary: The climatic change in the period 3. Characteristics of Quaternary: The flora and fauna in the period 4. Division and chronology of Quaternary 5. Division and chronology of the Pleistocene 6. Division and chronology of the Holocene 7. Quaternary defined as Anthropogene 8. Climatic changes in Quaternary 9. Environmental history of Quaternary 10. Climate changes in the Pleistocene and Holocene 11. Recent research on Holocene climate 12. Recent research on Pleistocene climate 13. Monsoon responding to the variation in regional insolation and global climate 13. Local climate responding to the variation in regional insolation and global climate		
Preparation and Review	Read papers in advance.		
Evaluation Method	Reports		
Comments to Students	Read papers introduced in the classes.		
Teaching Materials	To be announced separately.		
Remarks1			

Subject Code	SM32070011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Spatial Information Science		
Subject Number	SCG011505		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	VENKATESH RAGHAVAN		
Main Theme of the Subject	Introduction to advanced concepts of management and analysis of spatial data over the Internet. Further, students will gain to knowledge on spatial information services and learn to develop web mapping for spatial data aggregation, sharing, analysis and v		
Goal of the Subject	Introduction to advanced concepts of management and analysis of spatial data over the Internet. Further, students will gain to knowledge on spatial information services and learn to develop web mapping for spatial data aggregation, sharing, analysis and v		
Contents of the Subject /Subject Plan	Introduction to spatial information contents and recent trends in Web-GISGeospatial standards for interoperability of data and information servicesGeospatial Web Services (Web Mapping Services, Web Feature Services etc.)Spatial Database SystemsApplication development tools (PHP, JavaScript, Python, etc.)Development and management of Web mapping applicationVector Network Analysis and RoutingSpatial analysis of raster data and Image ProcessingGeoprocessing Services (1)Geoprocessing Services (2)Developing Geospatial Web Application (1)Developing Geospatial Web Application (2)Developing Geospatial Web Application (3)Presentation of prototype system development		
Preparation and Review	Study notes distributed before attending each class. Review the topics covered in each lecture after the lecture is over.		
Evaluation Method	Evaluation of oral presentation and report describing prototype Web-GIS application developed.		
Comments to Students	Basic knowledge of GIS, Hyper Text Markup Language (HTML) and Linux is required.		
Teaching Materials	Erik Westra, 2013, Python Geospatial Development, Packt Publishing, ISBN:178216152XAntonio Santiago Perez, 2012, OpenLayers Cookbook, Packt Publishing, ISBN: 1849517843The Open Geospatial Consortium, Inc. (OGC), http://www.opengeospatial.org/OSGeo-Live, h		
Remarks1			

Subject Code	SM32100011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Selected Topics in Environmental Geosciences III		
Subject Number	SCG011508		
Credit(s)	1 Credit	Teaching Method	Lecture
Lecturer(s)	Muneki Mitamura		
Main Theme of the Subject	This lecture will be an intensive course provided by a professor in other university or research institute. The following will be the potential targets of this lecture. - The latest research trends on the environment and transition in the atmosphere, hyd		
Goal of the Subject	To acquire state-of-the-art knowledge on environmental geology.		
Contents of the Subject /Subject Plan	Details will be announced at OCU UNIPA.		
Preparation and Review	Details will be announced at OCU UNIPA.		
Evaluation Method	Evaluated by exams, reports, questions and answers in the lecture, etc.		
Comments to Students	Since content changes in each fiscal year, those who will take a course should check the content and starting date on OCU UNIPA.		
Teaching Materials	Textbook etc. will be announced by a professor in charge.		
Remarks1			

Subject Code	SM32120011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Earth's Material Science I		
Subject Number	SCG021501		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Keiji Shinoda		
Main Theme of the Subject	Fundamental concepts of quantum theory is introduced for spectroscopic studies of minerals such as Mössbauer spectroscopy and infrared and Raman spectroscopies. Applications of Mössbauer spectroscopy in mineralogy are introduced especially for analyses o		
Goal of the Subject	This class aims the understanding of basic quantum theory by reading a text "Basic Quantum Theory by Ken-ichi Tsuchiya (Shokabo Co., Ltd.) (Japanese text book)", and applications of Mössbauer spectroscopic studies of iron-minerals.		
Contents of the Subject /Subject Plan	1-11 Careful reading of "Basic Quantum Theory by Ken-ichi Tsuchiya (Shokabo Co., Ltd.) (Japanese text book)" 12-14 Introduction of Mössbauer spectroscopic studies of minerals.		
Preparation and Review	Careful reading of "Basic Quantum Theory by Ken-ichi Tsuchiya (Shokabo Co., Ltd.) (Japanese text book)"		
Evaluation Method	Attendance and a few presentations on explanation "Basic Quantum Theory by Ken-ichi Tsuchiya (Shokabo Co., Ltd.) (Japanese text book)"		
Comments to Students	Careful reading of "Basic Quantum Theory by Ken-ichi Tsuchiya (Shokabo Co., Ltd.) (Japanese text book)"		
Teaching Materials	Careful reading of "Basic Quantum Theory by Ken-ichi Tsuchiya (Shokabo Co., Ltd.) (Japanese text book)"		
Remarks1			

Subject Code	SM32130011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Earth's Material Science II		
Subject Number	SCG021502		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Harue Masuda		
Main Theme of the Subject	The Earth is regarded as a closed system from the point of views of chemical thermodynamics, and a large part of natural phenomenon in the Earth occurs on the thermodynamic process. Physic-chemical factors playing as controlling roles on the energy and ma		
Goal of the Subject	Understanding the basic concept of chemical reaction related to various geologic phenomenons. Reviewing how to trace the geochemical processes using multi-element and multi-isotope analyses. Improving reading comprehension of English and logical thinking		
Contents of the Subject /Subject Plan	1 Earth system: composition and differentiation of the elements in the Earth. 2 Geochemical characteristics and speciation of the elements and isotopes. 3 Chemical reaction and equilibrium in natural system. 4 Radio-isotopes and geochlonology. 5 Stable isotopes and geothermometer. 6 Tracing sources and processes using stable isotopes. 7 Adsorption-desorption as a controlling factor on trace element behavior. 8 Complexing with organic matters as a controlling factor on trace element behavior. 9 Mineralization and cation exchange as a controlling factor on trace element behavior. 10 Tracing sources and processes using trace elements. 11 Carbon cycle and biogeochemical interaction associated with anthropogenic disturbance. 12 Environmental pollution and mitigation related to anthropogenic activities. 13 Mineral-water interaction at chemical weathering. 14 Physico-chemical processes and reaction time of mineralization.		
Preparation and Review	Reading English textbook to explain the content before each class.		
Evaluation Method	Evaluate based on the presentation in the class and final report.		
Comments to Students	it is hard work to complete the subject. However, you will recognize improved ability to use English after finishing the course of this class.		
Teaching Materials	References: Jacobson M.C. et al. (2000) Earth System Science From Biogeochemical Cycles to Global Change. International Geophysics Ser. V. 72, Academic Press; Schweitzer G. K. and Resterfield L. (2010) The aqueous chemistry of the elements. Oxford Univers		
Remarks1			

Subject Code	SM32140011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Petrology I		
Subject Number	SCG021503		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Takamoto Okudaira		
Main Theme of the Subject	Experience the process of considering the earth dynamics of billions of years from the analysis using structural geology and petrological methods.		
Goal of the Subject	Understand the fundamentals and analytical methods of structural geology and metamorphic petrology as a tool to elucidate the dynamics of the earth, apply it to the actual metamorphic belt, and acquire the research method of earth dynamics.		
Contents of the Subject /Subject Plan	(1) Contents and Introduction of this lecture: Metamorphism and deformation in the upper and lower crust (2) Gibbs energy and phase change: Clausius-Clapeyron equation and phase diagram of CaCO3 (3) Phase equilibrium of single phase system: Schreinemakers' method and phase diagram of aluminosilicate (4) Phase equilibrium of multi-phase system (Part 1): Free energy curve and phase diagram of SiO2-NaAlSi3O8 system (5) Phase equilibrium of multi-phase system (Part 2): Solid solution and entropy of mixing (6) Phase equilibrium of multi-phase system (Part 3): Schreinemakers' method for multiphase system (7) Analytical method for metamorphism (Part 1): Reduced representation of components and projection (8) Analytical method for metamorphism (Part 2): Continuous and discontinuous reactions (9) Analytical method for metamorphism (Part 3): Metamorphic isograd and zonation (10) Analytical method for metamorphism (Part 4): Metamorphic reactions and pressure-temperature path (11) Formation process and dynamics of regional metamorphic belts (12) Basics of rock deformation (Part 1): stress and strain (13) Basics of rock deformation (Part 2): brittle and ductile deformation (14) Basics of rock deformation (Part 3): Folding and shearing (15) Geodynamic aspects of metamorphism and deformation		
Preparation and Review	In order to understand the learning contents, it is important to solve the exercise problem. Therefore, it is desirable to prepare and review about two hours before and after each lesson.		
Evaluation Method	Evaluate by exercises done for each lecture.		
Comments to Students	I will show you separately.		
Teaching Materials	Metamorphic Phase Equilibria and Pressure-Temperature-Time Paths (Frank S. Spear, Mineralogical Society of America), Structural Geology (H. Fossen, Cambridge University Press)		
Remarks1			

Subject Code	SM32150011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Petrology II		
Subject Number	SCG021504		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Tetsuya Sakuyama		
Main Theme of the Subject	Igneous rocks preserve information of the deep earth which we cannot directly reach out for. Aim of this course is to understand the geochemical and petrological diversity of the igneous rocks and the dynamics inside the solid earth.		
Goal of the Subject	By analyzing igneous rocks using petrological and geochemical methods, we overview how to retrieve the thermal and material circulation processes of the mantle.		
Contents of the Subject /Subject Plan	1. Introduction: an overview of the magmatic processes from generation to eruption 2. Diversity of magma: rock series 3. Diversity of magma composition 1: crystal fractionation process 4. Diversity of magma composition 2: mixing of magma 5. Diversity of magma composition 3: contamination of crustal materials 6. Diversity of magma composition 4: diversity of the primary magma 7. Structure and physical properties of magma 8. Magmatic thermobarometer and hygrometer 9. Melting of the mantle: petrology of the upper mantle 10. Melting of the mantle: variation in magma composition with melting condition 11. Melting of the mantle: variation in magma composition with mantle composition 12. Melting of the mantle: diversity of melting process and behavior of trace elements 13. Melting of the mantle: variation in radiogenic isotope compositions of the magma and the mantle 14. Mantle dynamics deduced from igneous rocks: mid-ocean ridge, subduction and hotspot		
Preparation and Review	This lecture will be given based on the previous lectures related to petrology and solid earth. Reviewing those contents is highly recommended. Additionally, reading a textbook corresponding to the contents of the next lecture in advance should enhance yo		
Evaluation Method	Evaluate by exercises and reports etc. conducted in the lecture.		
Comments to Students	To be announced separately.		
Teaching Materials	Necessary materials will be distributed in the lecture.		
Remarks1			

Subject Code	SM32210011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Selected Topics in Earth Evolution Sciences IV		
Subject Number	SCG021509		
Credit(s)	1 Credit	Teaching Method	Lecture
Lecturer(s)	Tetsuya Sakuyama		
Main Theme of the Subject	This lecture will be an intensive course provided by a professor in other university or research institute. Evolution processes of the geosphere, hydrosphere, and biosphere throughout the history of the earth are the broad targets of this lecture. The		
Goal of the Subject	To obtain state-of-the-art knowledge on material and chemical evolution history of the earth.		
Contents of the Subject /Subject Plan	Details will be announced at OCU UNIPA.		
Preparation and Review	Details will be announced at OCU UNIPA.		
Evaluation Method	Evaluated by exams, reports, questions and answers in the lecture, etc.		
Comments to Students	Since content changes in each fiscal year, those who will take a course should check the content and starting date on OCU UNIPA.		
Teaching Materials	Textbook etc. will be announced by a professor in charge.		
Remarks1			

Subject Code	SM32260011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Lecture on Exploration Geophysics		
Subject Number	SCG011502		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Satoru Yamaguchi		
Main Theme of the Subject	Geophysical methods are widely used for investigating the Earth's interior. In order to properly understand and appropriately use these results, it is indispensable to understand the principle of measurements and data analysis accurately, and further k		
Goal of the Subject	(1) Understand the principle of geomagnetic survey method. (2) Know the latest results obtained by geomagnetic survey. (3) Understand the principle of seismic exploration. (4) Know the latest results obtained by seismic survey.		
Contents of the Subject /Subject Plan	1 Types and characteristics of geomagnetic survey method 2 Principle of Resistivity method 3 Application of Resistivity method 4 Principle of Magnetotelluric method 5 Application of Magnetotelluric method 6 Recent topics on subsurface structure of the active fault using geomagnetic method on active fault (1) 7 Recent topics on subsurface structure of the active fault using geomagnetic method on active fault (2) 8 Recent topics on subsurface structure of the active fault using geomagnetic method on active fault (3) 9 Recent topics on subsurface structure of the active fault using geomagnetic method on active fault (4) 10 Principle of Seismic Survey 11 Recent topics on subsurface structure of the active fault using seismic method (1) 12 Recent topics on subsurface structure of the active fault using seismic method (2) 13 Recent topics on subsurface structure of the active fault using seismic method (3) 14 Recent topics on subsurface structure of the active fault using seismic method (4)		
Preparation and Review	Before: Understanding the contents of the specified article. After : Review contents of the lecture and deepen understanding		
Evaluation Method	Evaluate by presentation of the article each person conducts.		
Comments to Students	To be announced separately.		
Teaching Materials	Designate at the first lecture.		
Remarks1			

Subject Code	SM32270011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Urban Geology		
Subject Number	SCG011503		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Tsuyoshi Haraguchi		
Main Theme of the Subject	Explain the basics of geological environment and geology management in Japan.		
Goal of the Subject	Understand the geological environment in Japan and learn the basics of geological management.		
Contents of the Subject /Subject Plan	1) Geological environment in Japan (Hokkaido) 2) Geological environment in Japan (Tohoku) 3) Geological environment in Japan (Kanto) 4) Geological environment in Japan (Hokuriku) 5) Geological environment in Japan (Chubu) 6) Geological environment in Japan (KInki) 7) Geological environment in Japan (Chugoku) 8) Geological environment in Japan (Shikoku) 9) Geological environment in Japan (Kyushu) 10-15) Geological management (earthquake, tsunami, volcano, landslide, flood, groundwater)		
Preparation and Review	Decide who is responsible for each theme, make presentation.		
Evaluation Method	Evaluate on th report.		
Comments to Students	Decide who is responsible for each theme, make presentation, deepen understanding of the theme while discussing.		
Teaching Materials	Distribute printing as appropriate		
Remarks1			

Subject Code	SM32280011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Advanced Historical Geology		
Subject Number	SCG021505		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Natsuko Adachi		
Main Theme of the Subject	This course presents the palaeobiology and evolution of marine organisms, and the secular change in earth surface environments, which were recorded in carbonate rocks.		
Goal of the Subject	Understanding the basic knowledge and methods to decipher the palaeoecology and succession of the marine organisms, and change in marine environments, recorded in the carbonate rocks.		
Contents of the Subject /Subject Plan	1 An introduction to carbonate rocks 2 Carbonate composition 3 Classification of carbonate rocks 4 Characteristic of microbialites and their classification 5 Mode of the microbialite construction 6 Succession of microbialites and their palaeoenvironmental changes 7 Carbonate diagenesis-1 8 Carbonate diagenesis-2 9 Carbonate depositional environments and facies 10 Characteristics of modern reefs and their depositional environments 11 Overview of ancient reefs 12 Characteristics of Precambrian carbonates 13 Palaeozoic reef ecology and palaeoenvironments 14 Mesozoic reef ecology and palaeoenvironments		
Preparation and Review	Students are recomended to read the text books prior to attending the corse.		
Evaluation Method	Evaluated by report.		
Comments to Students	To be announced separately.		
Teaching Materials	Hand-outs will be distributed during the lectures. Text books; James, N.P., and Jones, B. (2016) Origin of Carbonate Sedimentary Rocks, Wiley, 446 p.Flügel, E. (2004) Microfacies of Carbonate Rocks. Springer-Verlag, Berlin, Heidelberg, 976 pp.		
Remarks1			

Subject Code	SM33010011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Functional Ecology		
Subject Number	SCBG11501		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Satoshi Nanami		
Main Theme of the Subject	(1) Explanation on the definition of the “biodiversity”, the processes of the creatioin of the biodiversity, and the mecahanisms of the maintenance of the biodiversity. (2) Introduction of social activities to conserve and utilize the biodiversity in Japa		
Goal of the Subject	To understand the concept of the word, “biodiversity” that has already gained social recognition. To focus the “biodiversity” from variious viewpoints, i.e. natural, human and social sciences. To cultivate the ability of deep thinking about the conservati		
Contents of the Subject /Subject Plan	1st View of nature –How to recognize the nature- 2ed Diversity of environment 3rd The definition of biodiversity (1) -Species diversity- 4th The definition of biodiversity (2) -Genetic diversity- 5th The definition of biodiversity (3) -Ecosystem diversity- 6th The definition of biodiversity (4) -Diversity of interaction among organisms- 7th Extinction of organisms 8th Crisis of biodiversity 9th Invasive species in the world 10th Invasive species in Japan 11th Biodiversity and human life 12th Conservation and sustainable use of biodiversity (1) –Actions by citizens and local governments- 13th Conservation and sustainable use of biodiversity (2) -Actions by national governments- 14th Conservation and sustainable use of biodiversity (3) –International actions- 15th General discussions		
Preparation and Review	Preparations and reviews (ca. 2 hours each) for the classes are desirable by reading the books for reference that will be introduced.		
Evaluation Method	Report and presentation		
Comments to Students	Have interest in a lot of benefits of the biodiversity to our human life and serious problem that the biodiversity has been facing.		
Teaching Materials	Handouts are distributed in every class.		
Remarks1			

Subject Code	SM33040011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Selected Topics in Global Change ofBio-environment I		
Subject Number	SCBG11503		
Credit(s)	1 Credit	Teaching Method	Lecture
Lecturer(s)	Muneki Mitamura		
Main Theme of the Subject	This lecture will be an intensive course provided by a professor in other university or research institute. Aim of this lecture is to introduce basics of the meteorology, the ecology, and the evolutionary biology and to obtain wide range of knowledge about the impact of global environmental changes on ecosystems.		
Goal of the Subject	To acquire state-of-the-art knowledge on study of biological environmental change that is positioned in the boundary region between the biology and the geology.		
Contents of the Subject /Subject Plan	Details will be announced at the OCU UNIPA.		
Preparation and Review	Details will be announced at the OCU UNIPA.		
Evaluation Method	Evaluated by reports, questions and answers in the lecture, etc.		
Comments to Students	Since content changes in each fiscal year, those who will take a course should check the content and starting date on the OCU UNIPA.		
Teaching Materials	Textbook etc. will be announced by a professor in charge.		
Remarks1			

Subject Code	SM33070011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Geoinformatics		
Subject Number	SCG011504		
Credit(s)	2 Credits	Teaching Method	Lecture／Seminar
Lecturer(s)	Shinji Masumoto		
Main Theme of the Subject	Fundamental concepts, theories, application and actual system related to spatial information processing are introduced. Especially, GIS (Geographic Information System) and remote sensing for geoscience are focused on.		
Goal of the Subject	The student will understand the basic theories and techniques to collect, manage, visualize and analyze the geoscientific spatial data.		
Contents of the Subject /Subject Plan	1. Principles of GIS (Geographical Information System) 2. Processing and function of GIS 3. Installation method and basic operation of GIS 4. Coordinate system (Earth ellipsoid, Geodetic system, UTM projection etc.) 5. Terrain analysis 6. Practice: terrain analysis 7. Geological data processing 8. Three dimensional geologic modeling 9. Practice: geological data processing 10. Principles of remote sensing 11. Terrain analysis based on remote sensing 12. Environmental analysis based on remote sensing 13. Individual exercise: students are asked to pick up one of the problem in their research fields and to summarize the outline about it. 14. Presentation and discussion: each student is asked to make a presentation about the result of problem examined.		
Preparation and Review	Review the topics covered in each lecture after the lecture is over.		
Evaluation Method	Final presentation and report: 50%, Reports during classes : 50%.		
Comments to Students	Language: Japanese		
Teaching Materials	Not used; Class hand-outs are distributed when necessary. Reference book; Neteler, M. and Mitasova, H. (2008) Open Source GIS: A GRASS GIS Approach. Third edition. (Springer, New York).		
Remarks1			

Subject Code	SM33080011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Earth Evolution System		
Subject Number	SCBG11508		
Credit(s)	2 Credits	Teaching Method	Lecture
Lecturer(s)	Yoichi Ezaki		
Main Theme of the Subject	Lecture on the development processes of biosphere through the interrelationship between biotic evolution from the Archaean and global environmental changes.		
Goal of the Subject	Understanding of how biotic evolution had mutually changed with global environments from the birth of the Earth to the present.		
Contents of the Subject /Subject Plan	1st Present earth system compositions 2nd The birth of the Earth and the formation of earth system 3rd The birth of life in the Archaean (4 billion years ago)4th The emergence of eukaryote during the Proterozoic (2.5 billion years ago)5th The Snowball Earth and the changes in atmospheric composition 6th The emergence of multicellular animals in the Proterozoic 7th Geobiological backgrounds of the Cambrian explosion8th Images of the Cambrian explosion9th Great biodiversification in the Ordovician10th Organisms on land and the formation of large forests 11th End-Permian mass extinction and subsequent recovery12th End-Cretaceous mass extinction and subsequent recovery13th Changes of biota and secular reef fluctuations 14th Changes in global biotic environments and the formation of resources 15th Future of the earth system		
Preparation and Review	Confirm the contents of handouts distributed in advance. Review the contents after the lecture.		
Evaluation Method	Evaluation of reports assigned.		
Comments to Students	This is a multidisciplinary subject of the Division of Biology and Geosciences.		
Teaching Materials	Not specified. Refer to handouts as appropriate.		
Remarks1			

Subject Code	SM33100011	Offering Academic Year/Semester	2021 First Semester
Subject Name(English)	Selected Topics of Advanced Biology		
Subject Number	SCBG11506		
Credit(s)	1 Credit	Teaching Method	Lecture
Lecturer(s)	Tohru Komiya		
Main Theme of the Subject	A lecture on current topics in advanced biology by an expert from outside the university.		
Goal of the Subject	Students will deepen their knowledge on advanced biology.		
Contents of the Subject /Subject Plan	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Preparation and Review	Details are notified on the web (UNIPA) site and by the notice board of the biology department.		
Evaluation Method	By class attendance and report submission.		
Comments to Students	To be announced separately.		
Teaching Materials	To be announced separately.		
Remarks1			

Subject Code	SM33130011	Offering Academic Year/Semester	2021 Second Semester
Subject Name(English)	Advanced Geoinformatics		
Subject Number	SCG011511		
Credit(s)	2 Credits	Teaching Method	Lecture／Special Seminar
Lecturer(s)	Tatsuya Nemoto		
Main Theme of the Subject	This course presents three dimensional geologic modeling and estimation of topographic and geologic surface from outcrop data and borehole data. For better understanding of them, it provides training using geographic information system.		
Goal of the Subject	Through lectures and exercises using computer, students can understand estimation method of topographic surface and geologic surface, construction and visualization of three dimensional geologic model.		
Contents of the Subject /Subject Plan	1. Representation of spatial information 2. Generation of contour map and visualization of topographic surface 3. Estimation of geologic surface from elevation data 4. Estimation of geologic surface from strike and dip 5. Estimation of topographic surface from inter-contour height information 6. Basic theory of three dimensional geologic model 7. Construction of three dimensional geologic model(1) Estimation of geologic surface 8. Construction of three dimensional geologic model(2) Creation of logical model 9. Visualization of three dimensional geologic model 10. Construction of three dimensional geologic model using GIS(1) Estimation of geologic surface 11. Construction of three dimensional geologic model using GIS(2) Creation of logical model 12. Visualization of three dimensional geologic model using GIS 13. Exercises(1) Estimation of geologic surface 14. Exercises(2) Construction and visualization of geologic model		
Preparation and Review	Reading the textbook in advance and review after each class are necessary.		
Evaluation Method	Reports are used for grading.		
Comments to Students	A free open source GIS GRASS is used for a training.		
Teaching Materials	Required prints will be provided.		
Remarks1			

Subject Code	SM34020023	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Advanced Research Course for Master's Thesis of Science		
Subject Number	SCARC1601		
Credit(s)	6 Credits	Teaching Method	Seminar／Laboratory
Lecturer(s)	Satoru Yamaguchi,Natsuko Adachi,Shinji Masumoto,Tatsuya Nemoto,Keiji Shinoda,Takamoto Okudaira,Tetsuya Sakuyama,Harue Masuda,Yoichi Ezaki,Tsuyoshi Haraguchi,Muneki Mitamura,Jun Inoue		
Main Theme of the Subject	Using the systematic knowledge and techniques on the theory and experiments in each field of biology and geology, students practice the following and finally summarize the process and results as a master thesis. To set up specific research subjects on y		
Goal of the Subject	In order to found the cornerstone of development in future study, students acquire the ability to discover and solve research subjects in biology and geology on his own. In addition, students acquire the ability to transmit their research results internat		
Contents of the Subject /Subject Plan	Students are advised to arrange research tasks, design research plans, experiments, and field surveys, to interpret and summarize research results, and to complete the master thesis.		
Preparation and Review	Details will be shown later by each academic staff. Students are required to discover issues on their own and learn materials in advance and afterwards.		
Evaluation Method	Students will be comprehensively graded by research results, research attitude, and presentation content.		
Comments to Students	Students are required to join "Student Education Research Disaster Accident Insurance (Gakken)" and incidental liability (incidental liability) ".		
Teaching Materials	Details will be shown later by each academic staff.		
Remarks1			

Subject Code	SM34020013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Advanced Research Course for Master's Thesis of Science		
Subject Number	SCARC1601		
Credit(s)	6 Credits	Teaching Method	Seminar／Laboratory
Lecturer(s)	Mitsumasa Koyanagi,Kazuyuki Wakabayashi,Toshihiro Yamada,Makoto Miyata,Masanori Koda,Taro Fuchikawa,Tohru Komiya,Yoshihiro Yamaguchi,Kazuo Ito,Ken-ichi Fujita,Akihisa Terakita,Toshiro Mizuno,Kouichi Soga,Satoshi Nanami,Satoshi Awata,Akira Itoh,Chiyomi Uematsu,Satoshi Koi,Shinsuke Goto,Ryoji Masui,Taro Nakamura		
Main Theme of the Subject	Based on knowledge on biology, students will perform own research project and finally make a master dissertation.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges related to the theories and experiments underlying the fields of biology and earth science, set specific research subjects, make a research plan, interpret the research results. and present the accomplishments.		
Contents of the Subject /Subject Plan	Students perform research, and write a master's thesis under the guidance of the teacher in charge.		
Preparation and Review	Students are highly recommended to search and read textbooks and articles related to their research by themselves. Further details are provided by supavisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their daily research attitude, the quality of their experimental performance, oral presentation, and a master's thesis.		
Comments to Students	Students must take out disaster and accident insurance for student education and research.		
Teaching Materials	Details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34030013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Science of Biomolecules		
Subject Number	SCB011509		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Akihisa Terakita,Mitsumasa Koyanagi,Yoshihiro Yamaguchi,Kazuo Ito,Ken-ichi Fujita,Ryoji Masui		
Main Theme of the Subject	The aim of this course is to help students to understand fundamental elements of specific areas (science of biomolecules) in biology extensively, intensively and widely by reading basic articles, and to develop presentation skills.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges specific to science of biomolecules in biology by searching, reading and evaluating recent articles, and acquire presentation skills through progress reports and discussion		
Contents of the Subject /Subject Plan	Students read textbooks and articles (in English) to learn fundamental knowledge and recent progress of their own research. Students also report and assess their results of studies towards a master's thesis as well as improve their ability to make presentation.		
Preparation and Review	Students are highly recommended to prepare presentation according to the progress of their research. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their research reports and discussion in the seminar.		
Comments to Students	Details are provided by supervisors in the course.		
Teaching Materials	Students are highly recommended to search and read textbooks and articles by themselves. Further details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34040013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Science of Biomolecules		
Subject Number	SCB011609		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Akihisa Terakita,Mitsumasa Koyanagi,Yoshihiro Yamaguchi,Kazuo Ito,Ken-ichi Fujita,Ryoji Masui		
Main Theme of the Subject	The aim of this course is to help students to understand fundamental elements of specific areas (science of biomolecules) in biology extensively, intensively and widely by reading basic articles, and to develop presentation skills.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges specific to science of biomolecules in biology by searching, reading and evaluating recent articles, and acquire presentation skills through progress reports and discussion		
Contents of the Subject /Subject Plan	Students read textbooks and articles (in English) to learn fundamental knowledge and recent progress of their own research. Students also report and assess their results of studies towards a master's thesis as well as improve their ability to make presentation.		
Preparation and Review	Students are highly recommended to prepare presentation according to the progress of their research. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their research reports and discussion in the seminar.		
Comments to Students	Details are provided by supervisors in the course.		
Teaching Materials	Students are highly recommended to search and read textbooks and articles by themselves. Further details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34050013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Molecular Biofunctions		
Subject Number	SCB021509		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Makoto Miyata,Kazuyuki Wakabayashi,Tohru Komiya,Toshiro Mizuno,Kouichi Soga,Taro Nakamura		
Main Theme of the Subject	The aim of this course is to help students to understand fundamental elements of specific areas (molecular biofunctions) in biology extensively, intensively and widely by reading basic articles, and to develop presentation skills.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges specific to molecular biofunctions in biology by searching, reading and evaluating recent articles, and acquire presentation skills through progress reports and discussion a		
Contents of the Subject /Subject Plan	Students read textbooks and articles (in English) to learn fundamental knowledge and recent progress of their own research. Students also report and assess their results of studies towards a master's thesis as well as improve their ability to make presentation.		
Preparation and Review	Students are highly recommended to prepare presentation according to the progress of their research. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their research reports and discussion in the seminar.		
Comments to Students	Details are provided by supervisors in the course.		
Teaching Materials	Students are highly recommended to search and read textbooks and articles by themselves. Further details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34060013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Molecular Biofunctions		
Subject Number	SCB021609		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Makoto Miyata,Kazuyuki Wakabayashi,Tohru Komiya,Toshiro Mizuno,Kouichi Soga,Taro Nakamura		
Main Theme of the Subject	The aim of this course is to help students to understand fundamental elements of specific areas (molecular biofunctions) in biology extensively, intensively and widely by reading basic articles, and to develop presentation skills.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges specific to molecular biofunctions in biology by searching, reading and evaluating recent articles, and acquire presentation skills through progress reports and discussion a		
Contents of the Subject /Subject Plan	Students read textbooks and articles (in English) to learn fundamental knowledge and recent progress of their own research. Students also report and assess their results of studies towards a master's thesis as well as improve their ability to make presentation.		
Preparation and Review	Students are highly recommended to prepare presentation according to the progress of their research. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their research reports and discussion in the seminar.		
Comments to Students	Details are provided by supervisors in the course.		
Teaching Materials	Students are highly recommended to search and read textbooks and articles by themselves. Further details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34070013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Functional Biology of Natural History		
Subject Number	SCB031510		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Shinsuke Goto,Toshihiro Yamada,Masanori Koda,Taro Fuchikawa,Satoshi Nanami,Satoshi Awata,Akira Itoh,Chiyomi Uematsu,Satoshi Koi		
Main Theme of the Subject	The aim of this course is to help students to understand fundamental elements of specific areas (functional biology of natural history) in biology extensively, intensively and widely by reading basic articles, and to develop presentation skills.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges specific to functional biology of natural history by searching, reading and evaluating recent articles, and acquire presentation skills through progress reports and discussi		
Contents of the Subject /Subject Plan	Students read textbooks and articles (in English) to learn fundamental knowledge and recent progress of their own research. Students also report and assess their results of studies towards a master's thesis as well as improve their ability to make presentation.		
Preparation and Review	Students are highly recommended to prepare presentation according to the progress of their research. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their research reports and discussion in the seminar.		
Comments to Students	Details are provided by supervisors in the course.		
Teaching Materials	Students are highly recommended to search and read textbooks and articles by themselves. Further details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34080013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Functional Biology of Natural History		
Subject Number	SCB031610		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Shinsuke Goto,Toshihiro Yamada,Masanori Koda,Taro Fuchikawa,Satoshi Nanami,Satoshi Awata,Akira Itoh,Chiyomi Uematsu,Satoshi Koi		
Main Theme of the Subject	The aim of this course is to help students to understand fundamental elements of specific areas (functional biology of natural history) in biology extensively, intensively and widely by reading basic articles, and to develop presentation skills.		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges specific to functional biology of natural history by searching, reading and evaluating recent articles, and acquire presentation skills through progress reports and discussi		
Contents of the Subject /Subject Plan	Students read textbooks and articles (in English) to learn fundamental knowledge and recent progress of their own research. Students also report and assess their results of studies towards a master's thesis as well as improve their ability to make presentation.		
Preparation and Review	Students are highly recommended to prepare presentation according to the progress of their research. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their research reports and discussion in the seminar.		
Comments to Students	Details are provided by supervisors in the course.		
Teaching Materials	Students are highly recommended to search and read textbooks and articles by themselves. Further details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34090013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Environmental Geosciences		
Subject Number	SCG011510		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Satoru Yamaguchi,Shinji Masumoto,Tatsuya Nemoto,Tsuyoshi Haraguchi,Muneki Mitamura,Jun Inoue		
Main Theme of the Subject	The class will provide opportunities for students to plan, conduct and report an individual work with a specific topic related to the work.		
Goal of the Subject	The student will gain specialized knowledge related to the individual work.		
Contents of the Subject /Subject Plan	Details will be given by the respective professors.		
Preparation and Review	Read papers introduced by the respective professors.		
Evaluation Method	Attendance, reports, and discussion and presentation in the seminar		
Comments to Students	Details will be given by the respective professors.		
Teaching Materials	Details will be given by the respective professors.		
Remarks1			

Subject Code	SM34100013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Environmental Geosciences		
Subject Number	SCG011601		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Satoru Yamaguchi,Shinji Masumoto,Tatsuya Nemoto,Tsuyoshi Haraguchi,Muneki Mitamura,Jun Inoue		
Main Theme of the Subject	The class will provide opportunities to plan, conduct and report an individual work with a specific topic related to the work.		
Goal of the Subject	The student will gain specialized knowledge related to the individual work.		
Contents of the Subject /Subject Plan	Details will be given by the respective professors.		
Preparation and Review	Read papers introduced by the respective professors.		
Evaluation Method	Attendance, reports, and discussion and presentation in the seminar		
Comments to Students	Details will be given by the respective professors.		
Teaching Materials	Details will be given by the respective professors.		
Remarks1			

Subject Code	SM34110013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Earth Evolution Sciences		
Subject Number	SCG021510		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Natsuko Adachi,Keiji Shinoda,Takamoto Okudaira,Tetsuya Sakuyama,Harue Masuda,Yoichi Ezaki		
Main Theme of the Subject	This course aims to have students introduce the contents and discuss the latest research papers in the field of Earth Evolution. Students are also required to report the progress of their own research theme and discuss them in the seminar		
Goal of the Subject	In order to deepen the understanding of each lecture in the field of Earth Evolution Chemistry and to acquire a wide range of expert knowledge, students are required to practice problems and read basic academic papers.		
Contents of the Subject /Subject Plan	Details will be shown later by each academic staff.		
Preparation and Review	Students are required to learn materials in advance and afterwards.		
Evaluation Method	Students will be comprehensively graded in terms of attendance, reports and discussions at the seminar.		
Comments to Students	Details will be shown later by each academic staff.		
Teaching Materials	Details will be shown later by each academic staff.		
Remarks1			

Subject Code	SM34120013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Exercises in Earth Evolution Sciences		
Subject Number	SCG021601		
Credit(s)	4 Credits	Teaching Method	Seminar
Lecturer(s)	Natsuko Adachi,Keiji Shinoda,Takamoto Okudaira,Tetsuya Sakuyama,Harue Masuda,Yoichi Ezaki		
Main Theme of the Subject	This course aims to have students introduce the contents and discuss the latest research papers in the field of Earth Evolution. Students are also required to report the progress of their own research theme and discuss them in the seminar.		
Goal of the Subject	In order to deepen the understanding of each lecture in the field of Earth Evolution Chemistry and to acquire a wide range of expert knowledge, students are required to practice problems and read basic academic papers.		
Contents of the Subject /Subject Plan	Details will be shown later by each academic staff.		
Preparation and Review	Students are required to learn materials in advance and afterwards.		
Evaluation Method	Students will be comprehensively graded in terms of attendance, reports and discussions at the seminar.		
Comments to Students	Details will be shown later by each academic staff.		
Teaching Materials	Details will be shown later by each academic staff.		
Remarks1			

Subject Code	SM34130013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Advanced Research Course for Master's Thesis of Biology I		
Subject Number	SCARC1501		
Credit(s)	6 Credits	Teaching Method	Seminar／Laboratory
Lecturer(s)	Mitsumasa Koyanagi,Kazuyuki Wakabayashi,Toshihiro Yamada,Makoto Miyata,Masanori Koda,Taro Fuchikawa,Tohru Komiya,Yoshihiro Yamaguchi,Kazuo Ito,Ken-ichi Fujita,Akihisa Terakita,Toshiro Mizuno,Kouichi Soga,Satoshi Nanami,Satoshi Awata,Akira Itoh,Chiyomi Uematsu,Satoshi Koi,Shinsuke Goto,Ryoji Masui,Taro Nakamura		
Main Theme of the Subject	The aim of this course is to help students to set specific research subjects on the basis of the fields of biology and earth science under the guidance of the teacher in charge, make a research plan, interpret the results of laboratory and field experimen		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges related to the theories and experiments underlying the fields of biology and earth science, set specific research subjects, make a research plan, interpret the results of th		
Contents of the Subject /Subject Plan	Students should belong to a laboratory in the field of biology in Division of Biology and Geosciences, perform research, and write a master's thesis under the guidance of the teacher in charge. Students are guided in developing their skills and abilities in the following activities: (1) Setting specific issues and drafting a research plan (2) Experimental and fieldwork methods for research (3) Analysis and evaluation of research results (4) Summarizing and presenting research results and writing a master's thesis (5) Search for academic information, including articles, necessary for research (6) How to discuss research results		
Preparation and Review	Students are highly recommended to search and read textbooks and articles related to their research by themselves. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their daily research attitude, the quality of their experimental performance, oral presentation, and a master's thesis.		
Comments to Students	Students must take outdisaster and accident insurance for student education and research.		
Teaching Materials	Details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34140013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Advanced Research Course for Master's Thesis of Biology II		
Subject Number	SCARC1601		
Credit(s)	6 Credits	Teaching Method	Seminar／Laboratory
Lecturer(s)	Mitsumasa Koyanagi,Kazuyuki Wakabayashi,Toshihiro Yamada,Makoto Miyata,Masanori Koda,Taro Fuchikawa,Tohru Komiya,Yoshihiro Yamaguchi,Kazuo Ito,Ken-ichi Fujita,Akihisa Terakita,Toshiro Mizuno,Kouichi Soga,Satoshi Nanami,Satoshi Awata,Akira Itoh,Chiyomi Uematsu,Satoshi Koi,Shinsuke Goto,Ryoji Masui,Taro Nakamura		
Main Theme of the Subject	The aim of this course is to help students to set specific research subjects on the basis of the fields of biology and earth science under the guidance of the teacher in charge, make a research plan, interpret the results of laboratory and field experimen		
Goal of the Subject	By the end of the course, students will be able to acquire fundamental knowledges related to the theories and experiments underlying the fields of biology and earth science, set specific research subjects, make a research plan, interpret the results of th		
Contents of the Subject /Subject Plan	Students should belong to a laboratory in the field of biology in Division of Biology and Geosciences, perform research, and write a master's thesis under the guidance of the teacher in charge. Students are guided in developing their skills and abilities in the following activities: (1) Setting specific issues and drafting a research plan (2) Experimental and fieldwork methods for research (3) Analysis and evaluation of research results (4) Summarizing and presenting research results and writing a master's thesis (5) Search for academic information, including articles, necessary for research (6) How to discuss research results		
Preparation and Review	Students are highly recommended to search and read textbooks and articles related to their research by themselves. Further details are provided by supervisors in the course.		
Evaluation Method	Students are evaluated comprehensively based on their daily research attitude, the quality of their experimental performance, oral presentation, and a master's thesis.		
Comments to Students	Students must take outdisaster and accident insurance for student education and research.		
Teaching Materials	Details are provided by supervisors in the course.		
Remarks1			

Subject Code	SM34150013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Advanced Research Course for Master's Thesis of Geosciences I		
Subject Number	SCARC1501		
Credit(s)	6 Credits	Teaching Method	Seminar／Laboratory
Lecturer(s)	Yoichi Ezaki, Natsuko Adachi, Satoru Yamaguchi, Shinji Masumoto, Tatsuya Nemoto, Keiji Shinoda, Takamoto Okudaira, Tetsuya Sakuyama, Harue Masuda, Tsuyoshi Haraguchi, Muneki Mitamura, Jun Inoue		
Main Theme of the Subject	Using the systematic knowledge and techniques on the theory and experiments in each field of biology and geology, students practice the following and finally summarize the process and results as a master thesis. To set up specific research subjects on y		
Goal of the Subject	In order to found the cornerstone of development in future study, students acquire the ability to discover and solve research subjects in biology and geology on his own. In addition, students acquire the ability to transmit their research results internat		
Contents of the Subject /Subject Plan	Students are advised to arrange research tasks, design research plans, experiments, and field surveys, to interpret and summarize research results, and to complete the master thesis.		
Preparation and Review	Details will be shown later by each academic staff. Students are required to discover issues on their own and learn materials in advance and afterwards.		
Evaluation Method	Students will be comprehensively graded by research results, research attitude, and presentation content.		
Comments to Students	Students are required to join "Student Education Research Disaster Accident Insurance (Gakken)" and incidental liability (incidental liability) ".		
Teaching Materials	Details will be shown later by each academic staff.		
Remarks1			

Subject Code	SM34160013	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	Advanced Research Course for Master'sThesis of Geosciences II		
Subject Number	SCARC1601		
Credit(s)	6 Credits	Teaching Method	Seminar／Laboratory
Lecturer(s)	Yoichi Ezaki, Natsuko Adachi, Satoru Yamaguchi, Shinji Masumoto, Tatsuya Nemoto, Keiji Shinoda, Takamoto Okudaira, Tetsuya Sakuyama, Harue Masuda, Tsuyoshi Haraguchi, Muneki Mitamura, Jun Inoue		
Main Theme of the Subject	Using the systematic knowledge and techniques on the theory and experiments in each field of biology and geology, students practice the following and finally summarize the process and results as a master thesis. To set up specific research subjects on y		
Goal of the Subject	In order to found the cornerstone of development in future study, students acquire the ability to discover and solve research subjects in biology and geology on his own. In addition, students acquire the ability to transmit their research results internat		
Contents of the Subject /Subject Plan	Students are advised to arrange research tasks, design research plans, experiments, and field surveys, to interpret and summarize research results, and to complete the master thesis.		
Preparation and Review	Details will be shown later by each academic staff. Students are required to discover issues on their own and learn materials in advance and afterwards.		
Evaluation Method	Students will be comprehensively graded by research results, research attitude, and presentation content.		
Comments to Students	Students are required to join "Student Education Research Disaster Accident Insurance (Gakken)" and incidental liability (incidental liability) ".		
Teaching Materials	Details will be shown later by each academic staff.		
Remarks1			

Subject Code	SM40010043	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	International Advanced Research Course for Master's Thesis of Science 1		
Subject Number			
Credit(s)	1 Credit	Teaching Method	Seminar
Lecturer(s)	Mitsumasa Koyanagi,Kazuyuki Wakabayashi,Toshihiro Yamada,Makoto Miyata,Masanori Koda,Taro Fuchikawa,Tohru Komiya,Yoshihiro Yamaguchi,Kazuo Ito,Ken-ichi Fujita,Akihisa Terakita,Toshiro Mizuno,Kouichi Soga,Satoshi Nanami,Satoshi Awata,Akira Itoh,Chiyomi Uematsu,Satoshi Koi,Shinsuke Goto,Ryoji Masui,Taro Nakamura		
Main Theme of the Subject	Students will perform own research project and have the presentation abroad. Students will acquire a worthwhile educational experience abroad.		
Goal of the Subject	Students are expected to learn manner for performing own research project abroad and also to develop ability to communicate with foreigner.		
Contents of the Subject /Subject Plan	The course consists of three steps. (1) Before study abroad: students will discuss with faculties about the theme of own research project and the potential candidate institute abroad for the study. Students will learn skills to communicate with foreign researchers. (2) Study abroad: students will perform own research project and have the presentation abroad. (3) After study abroad: when students will return to Japan, they make a presentation of the results and experiences of the study abroad.		
Preparation and Review	To be announced separately.		
Evaluation Method	By the progress in own research project and the quality of the presentation.		
Comments to Students	Students should consult with faculties about the program of study abroad in advance.		
Teaching Materials	To be announced separately.		
Remarks1			

Subject Code	SM40010053	Offering Academic Year/Semester	2021 First Semester 2021 Second Semester
Subject Name(English)	International Advanced Research Course for Master's Thesis of Science 1		
Subject Number			
Credit(s)	1 Credit	Teaching Method	Seminar
Lecturer(s)	Yoichi Ezaki, Natsuko Adachi, Satoru Yamaguchi, Shinji Masumoto, Tatsuya Nemoto, Keiji Shinoda, Takamoto Okudaira, Tetsuya Sakuyama, Harue Masuda, Tsuyoshi Haraguchi, Muneki Mitamura, Jun Inoue		
Main Theme of the Subject	Through research activities and academic exchanges abroad, this course aims to enable students to have experience in international scientific field.		
Goal of the Subject	Through overseas research activities, this course aims to enable students to advance the research goals of the master thesis, to achieve research goals, and to participate in the scientific community with overseas students and researchers in the research		
Contents of the Subject /Subject Plan	Through overseas research activities, this course aims to enable students to advance the research goals of the mthesis, to achieve research goals, and to participate in the scientific community of overseas students and researchers in the research field.		
Preparation and Review	Details will be shown later by each academic staff. Students are required to discover issues on their own and learn materials in advance and afterwards.		
Evaluation Method	Students are graded according to research results and research progress. Improvement of presentation and communication skills in English will also be taken into account.		
Comments to Students	Students are required to consult with their supervisor before registering about their research plans.		
Teaching Materials	Details will be shown later by each academic staff.		
Remarks1			