

## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Aquatic Biology	Semester Credit	Summer Session 2
Key words	Plankton, Benthos, Nekton, Algae, Marine Ecology		
Professor	Professor Tomoko YAMAMOTO Professor Toru KOBARI Associate professor Gen KUME Assistant professor Hikaru ENDO		
Contact office	Rm. 3-2, Build.1 (Prof. Yamamoto), Rm. 2-5, Build. 5 (Prof. Kobari) Rm. 3-4, Build. 5 (Prof. Kume), Rm. 3-5, Build. 5 (Prof. Endo)		
Contact hours	During the intensive course (16:00 - 18:00)		
Target	To let students to obtain basic knowledge for 1) biology and ecology of marine organisms, 2) food web and marine ecosystem, 3) their impacts on fisheries and human activities.		
Course description	1) Objectives of this lecture are to understand basic and general knowledge on aquatic biology. 2) The lecturers provide biology and ecology of marine organisms, food web and marine ecosystems and their impacts on fisheries and human activities. 3) This lecture is separated into four major sections that are conducted by four professors, respectively. Each major section is scheduled for one day. Students are subjected to a report to check their understandings.		
Schedule	1. Plankton Biology and Ecology 1: T. Kobari (Online class using Zoom) 2. Plankton Biology and Ecology 2: T. Kobari (Online class using Zoom) 3. Plankton Biology and Ecology 3: T. Kobari (Online class using Zoom) 4. Plankton Biology and Ecology 4: T. Kobari (Online class using Zoom) 5. Biology and Ecology Benthic Animals 1: T. Yamamoto (Online class using Zoom) 6. Biology and Ecology Benthic Animals 2: T. Yamamoto (Online class using Zoom) 7. Biology and Ecology Benthic Animals 3: T. Yamamoto (Online class using Zoom) 8. Biology and Ecology Benthic Animals 4: T. Yamamoto (Online class using Zoom) 9. Fish Biology and Ecology 1: G. Kume (Online class using Zoom) 10. Fish Biology and Ecology 2: G. Kume (Online class using Zoom) 11. Fish Biology and Ecology 3: G. Kume (Online class using Zoom) 12. Fish Biology and Ecology 4: G. Kume (Online class using Zoom) 13. Algae Biology and Ecology 1: H. Endo (Online class using Zoom) 14. Algae Biology and Ecology 2: H. Endo (Online class using Zoom) 15. Algae Biology and Ecology 3: H. Endo (Online class using Zoom)		
Important items	1. Students should have basic knowledge on marine biology, marine ecology and biological oceanography. 2. Lecturers will provide documents and the related information before online class. 10 minutes before the class starts, students should come to the waiting room and indicate their name as ID.		
Self-studies and other advices	Students need to prepare each class (biology and ecology of plankton, benthos, fish and algae and the related issues) using the documents provided by each lecturer.		
Textbooks	Documents are provided and the related materials will be introduced.		
Requisites to take subject:	None		
Assessment method:	Each assessment (short reports) of practice in schedule 4, 8, 12 and 15		

Evaluation criteria: Pass if each assessment (short reports) of practice in schedule 4, 8, 12 and 15 is more than 60%. Final score is provided as average of these scores at the four short reports.

Relevant matters: This class is basically described in English.

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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Aquatic Bioresource Science and Technology	Semester Credit	Summer Session 2
Key words	Biological characteristics of fisheries resources, stock management, fishing equipment and methods, fish behavior, improvement of fishing technology		
Professor	Professor ANRAKU Kazuhiko (Coordinator) Professor OHTOMI Jun Associate Professor DOI Wataru Associate Professor EBATA Keigo Associate Professor ISHIZAKI Munechika Associate Professor NISHI Takaaki Associate Professor YAMANAKA Yuichi		
Contact office	anraku@fish.kagoshima-u.ac.jp ohtomi@fish.kagoshima-u.ac.jp doiw@fish.kagoshima-u.ac.jp ebata@fish.kagoshima-u.ac.jp ishizaki@fish.kagoshima-u.ac.jp nishi@fish.kagoshima-u.ac.jp yamanaka@fish.kagoshima-u.ac.jp		
Contact hours	After class 16:00-17:00 between Sep 6 and Sep 9		
Target	This course is designed to gain basic and scientific knowledge on fisheries resource sciences such as capture fisheries, fisheries resource biology, and fisheries engineering so as to cumulate comprehensive knowledge in this field as a skill necessary to solve various issues.		
Course description	This course provides explanations on fisheries resources, biological characteristics, fishing gear and operation, fish behavior, and measuring instruments used in the fishing operation.		
Schedule	<ol style="list-style-type: none"> <li>1. "Current status of Japanese/world fisheries and regulations-1" by Anraku (Online Real-time by Zoom)</li> <li>2. "Current status of Japanese/world fisheries and regulations-2" by Anraku (Online Real-time by Zoom)</li> <li>3. "Community Based Fisheries Management and Fisheries Development Cooperation-1" by Ishizaki (Online Real-time by Zoom)</li> <li>4. "Community Based Fisheries Management and Fisheries Development Cooperation-2" by Ishizaki (Online Real-time by Zoom)</li> <li>5. "Fishing technology in Japan for harvesting fresh seafood and sustainable fisheries-1" by Ebata (Online Real-time by Zoom)</li> <li>6. "Fishing technology in Japan for harvesting fresh seafood and sustainable fisheries-2" by Ebata (Online Real-time by Zoom)</li> <li>7. "Fishing technology in Japan for harvesting fresh seafood and sustainable fisheries-3" by Ebata (Online Real-time by Zoom)</li> <li>8. "Fishery electronic equipment: Fish Finder, GPS, RADAR" by Nishi (Online Real-time by Zoom)</li> <li>9. "Fishery electronic equipment: GPS, RADAR. Environmental observation by the remote sensing" by Nishi (Online Real-time by Zoom)</li> <li>10. "Introduction of fisheries acoustics" by Yamanaka (Online Real-time by Zoom)</li> <li>11. "Application of fisheries acoustic equipment" by Yamanaka (Online Real-time by Zoom)</li> <li>12. "Basics of Fisheries Biology-1" by Ohtomi (at Classroom)</li> <li>13. "Basics of Fisheries Biology-1" by Ohtomi (at Classroom)</li> <li>14. "Biological characteristics of fisheries resources: Somatic Growth and its Analysis-1" By Doi (on demand video distribution)</li> <li>15. "Biological characteristics of fisheries resources: Somatic Growth and its Analysis-2" By Doi (on demand video distribution)</li> </ol>		

Important items	To understand the basic knowledge on fisheries resource sciences
Self-studies and other advices	Homework needs searching and summarizing journal papers and preparing reports on all items of 15 lectures.
Textbooks	Handout is prepared by the lecturer
Requisites to take subject:	Unconditional and no prerequisite
Assessment method	Pass if satisfactory reporting and participating into discussions are not less than 60% of classes. Total evaluation is consisted of report 80% and discussion participation 20%.
Evaluation criteria	Pass if score is not less than 60%
Relevant matters	

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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Aquaculture	Semester Credit	Summer Session 2
Key words	Nutrition, Fish physiology, Fish disease, Larval rearing		
Professor	Professor Tomonari KOTANI Professor Manabu ISHIKAWA Associate professor Satoshi TASUMI Assistant professor Saichiro YOKOYAMA Professor Miguel VAZQUEZ ARCHDALE		
Contact office	kotani@fish.kagoshima-u.ac.jp (TK), ishikawa@fish.kagoshima-u.ac.jp (MI), tasumi@fish.kagoshima-u.ac.jp (ST), yokoyama@fish.kagoshima-u.ac.jp (SY), miguel@fish.kagoshima-u.ac.jp (MVA)		
Contact hours	Monday 8:50 am-10:20 am (MI) Monday 2:30 pm-4pm (SY) Tuesday 0:50 pm-2:20 pm (TK) Friday 4:10 pm-5:40 pm (ST)		
Target	To let students to be able to understand principles of: methodology of aquaculture, present status of aquaculture of typical fish and shellfish species, latest information of aquaculture production in Japan and other countries.		
Course description	Principles of: the fundamental knowledge of system and present status of aquaculture and stock enhancement, carried out in Japan and all over the world		
Schedule	<ol style="list-style-type: none"> <li>1. Rearing methods of larval finfish</li> <li>2. Live feeds for larval finfish</li> <li>3. Aquafarming</li> <li>4. Methodology for improvement of survival</li> <li>5. Lipid nutrition of aquatic animals</li> <li>6. Interaction of nutrients in aquatic animals</li> <li>7. Research of aquatic nutrition and isotope</li> <li>8. Environmental conservation for aquaculture and recycled land-based aquaculture system</li> <li>9. Anti-nutritional factors in feed ingredients</li> <li>10. Nutrigenomics in fish nutrition</li> <li>11. Recent methods for fish and shellfish immunology</li> <li>12. Recent topics of fish and shellfish immunology</li> <li>13. Infectious diseases in cultured species</li> <li>14. Integration aquaculture and small-scale fish farming</li> <li>15. Introduction to crustacean aquaculture</li> </ol>		
Important items:	1) Understanding the methodology of aquaculture, 2) Learning the present status of aquaculture of typical fish and shellfish species and acquiring the knowledge of the method for aquaculture of those species, 3) Understanding the latest information of aquacultural production in Japan and other countries		
Self-studies and other advices	Each lecturer will direct the contents.		
Textbooks	Textbook: In this class, it is not specified. Reference books are used as needed. Reference books: Fish Nutrition (John E. Halver, Ronald Hardy) Academic Press, 2002 Success Factors for Fish Larval Production (Luis Conceicao, Amos Tandler) Wiley Blackwell, 2018 Fish Diseases and Medicine (Stephen A. Smith) CRC Press, 2019		

Requisites to take subject:	Unconditional and no prerequisite
Assessment method	Understanding level of the contents provided in the class will be evaluated based on examination and/or report
Evaluation criteria	Pass if the sum of report evaluation or examination score is equal to or more than 60%.
Relevant matters	Explanations in English when overseas students are in the class

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## Graduate School of Agriculture, Forestry and Fisheries, Kagoshima University

Subject title	Technology, Sustainable Food and Agriculture: Semester 2 The Synergy Credit 2
Key words	Global food production, Global forces, Smart agriculture, Bio-based/bio-inspired technologies, Nanobiotechnology
Lecturer	Mun'delanji Catherine M. VESTERGAARD, Associate Professor
Contact office	Rm. 2242; Tel: ext: 3520
Office hours	During semester time (Tuesdays: 12:00 to 14:00)
Course Goals	The course covers the current state of food resources in the world, and how global forces - including demographic pressure, climate changes, changing food habits and access to resources - impact the limited resources present. We will discuss the <i>expected</i> state of food resources in the coming 20 to 30 years, against the backdrop of the global forces; and the efforts underway to address the <i>expected</i> imbalance between food demand and supply. The key to addressing the issue is attaining sustainability whilst improving health, food security and livelihoods (socio-economic standing) of all global citizens. Advances in technology are playing a huge role in starting to address this huge challenge. We will discuss some of these efforts, in particular, how smart approaches like precision agriculture, bio-based and nanobiotechnologies are being utilized in food, and agriculture fields.
Course description	The course will be conducted over 15 weeks, using active and student-centred learning. Students will also be required to give presentations twice, during the course.
Schedule	<ol style="list-style-type: none"><li>1. Introduction to the Course and its Requirements</li><li>2. Global Food Resource Production</li><li>3. Limited Resources</li><li>4. Food Excess, Loss and Waste</li><li>5. Food Sustainability and Challenges</li><li>6. Student presentations</li><li>7. Introduction to Technology in Agriculture</li><li>7. Smart Agriculture</li><li>9. Precision Agriculture</li><li>10. Bio-based technologies</li><li>11. Bio-inspired technologies</li><li>12. Student Presentations</li><li>13. Nanotechnology</li><li>14. Nanobiotechnology</li><li>15. Sustainable food production, technologies, challenges and future prospects</li></ol>
Important items	To understand the basic knowledge on food resource production; global forces and challenges; and the role of technology for sustainable food production
Self-studies and Study materials	Students will be provided key words and phrases a week before for self-study in order to get a little bit familiar with the subject matter.
Requisites to take subject:	Unconditional and no prerequisite
Assessment method:	Participation (15%); Student Presentations (60%); Reports (25%).
Relevant matters:	This class is basically conducted in English.

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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Marketing and Management in Fisheries	Semester	1
		Credit	2
Key words	Marketing in fisheries, food processing in fisheries, management in fisheries, business management in fisheries		
Professor	Prof. SANO Masaaki Associate Prof. TORII Takashi Associate Prof. KUGA Mizuho Assistant Prof. SUZUKI Takashi		
Contact office	Depends on each teacher		
Contact hours	Depends on each teacher		
Target	The subject will provide, in English, basic facts regarding rational use of aquatic resources and fishing grounds; local revitalization primarily through the promotion the fisheries industry; stable development of the fisheries industry and management in fisheries; distribution and processing of marine products; and consumption and marketing of marine products.		
Course description	Students will learn, in English, fisheries system, functions of fishing cooperatives, and distribution and consumption of marine products. In addition, they will conduct a presentation and Q		
Schedule	<ol style="list-style-type: none"> <li>1. Fisheries system in Japan</li> <li>2. Characteristics and business performance of fishing cooperatives</li> <li>3. Characteristics and business performance of fishing management units</li> <li>4. Management of fishing resources and fisheries businesses in local communities</li> <li>5. Presentations and Q</li> <li>6. Commodity character of fresh marine products and characteristics of marine products distribution</li> <li>7. Structure and function of wholesale markets near producers</li> <li>8. Structure and function of wholesale markets near consumers</li> <li>9. Characteristics of the consumption and marketing of marine products</li> <li>10. Presentations and Q</li> <li>11. Product knowledge of main processed marine products</li> <li>12. Marine product processing industry's response to globalization</li> <li>13. Marine product processing industry's response to the trend of convenience</li> <li>14. Present condition of the fishery processing business</li> <li>15. Presentations and Q</li> </ol>		
Important items	<p>In principle, this lecture will be given face-to-face. However, from the viewpoint of countermeasures against new coronary infections, the class may be held remotely. Please note that you will be contacted via manaba in such cases.</p> <p>Notes : Students will have to prepare a PPT presentation material, make a presentation in English, and participate actively in the Q</p>		
Self-studies and other advices	Students will prepare for and review each class in addition to preparing for the presentation and Q		
Textbooks	Texts handed out by the teaching staff.		
Requisites to take subject:	Unconditional and no prerequisite		
Assessment method	Contents of the presentation, attitude toward the Q		
Evaluation criteria	Pass if satisfactory reporting and participating into discussions are not less than 60% of the classes		
Relevant matters	Conducted in English together with supplementary explanations in Japanese occasionally		



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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Environmental and Conservation Sciences	Semester	1
		Credit	2
Key words	Pollution of aquatic environments, Water quality, Risk assessment, environmental toxicology, Bioaccumulation, Biomarker, environmental microbiology, red tides, bioremediation		
Professor	Professor YOSHIKAWA Takeshi Professor UNO Seiichi Assistant Professor KOKUSHI Emiko Associate Professor OKUNISHI Suguru Assistant Professor YAMASAKI Masatoshi		
Contact office	yoshi@fish.kagoshima-u.ac.jp uno@fish.kagoshima-u.ac.jp kokushi@fish.kagoshima-u.ac.jp okunishi@fish.kagoshima-u.ac.jp m-yamasaki@fish.kagoshima-u.ac.jp		
Contact hours	The fourth period, Monday		
Target	Students will acquire the basic knowledge about aquatic environments and conservation of fishing ground environments. Specifically, students will develop an understanding about the anthropogenic pollution of aquatic environments by chemicals; eutrophication; their effects on aquatic biological resources and aquatic ecosystems; and the problem of algae blooms. By doing so, they will be able to clarify the relationship between the conservation of aquatic environments and the production of aquatic bioresources.		
Course description	The subject will provide the basic knowledge about the conservation of fishing ground environments where aquatic bioresources are produced. The purpose is to maintain sustainable production of aquatic bioresources and assure the safety in the use/utilization of aquatic bioresources. Specifically, students will develop a good understanding about the present condition of the anthropogenic pollution of aquatic environments by chemicals and eutrophication of fishing grounds; the effects of these on aquatic bioresources and aquatic ecosystems; and the occurrence of algae blooms and their effects on the production of aquatic bioresources.		
Schedule	<ol style="list-style-type: none"> <li>1. Basics of water quality (Uno/Kokushi)</li> <li>2. Distribution and dynamics of environmental pollutants I (Uno/Kokushi)</li> <li>3. Distribution and dynamics of environmental pollutants II (Uno/Kokushi)</li> <li>4. Effects of chemicals to organisms (Uno/Kokushi)</li> <li>5. Oil Pollution I (Uno/Kokushi)</li> <li>6. Oil Pollution II (Uno/Kokushi)</li> <li>7. Basics of host defense (Yamasaki)</li> <li>8. Relation between environmental pollutants and immunotoxicity I (Yamasaki)</li> <li>9. Relation between environmental pollutants and immunotoxicity II (Yamasaki)</li> <li>10. Basics of harmful microalgal blooms (Yoshikawa)</li> <li>11. Basics of measures on harmful microalgal blooms (Yoshikawa)</li> <li>12. Application of measures on harmful microalgal blooms (Yoshikawa)</li> <li>13. Examples of harmful microalgal blooms (Okunishi)</li> <li>14. Countermeasures against harmful microalgal blooms (Okunishi)</li> <li>15. Basics of environmental microbiology (Okunishi)</li> </ol>		
Important items:	to understand the principles of environmental pollution, their mechanisms and effects		
Self-studies and other advices	【Preparation】 Students read the distributed reference materials and the reference books specified in the section of textbooks/reference books and organize in their lecture notes the contents of the next class.		

	<b>【Review】</b> Students organize their lecture notes the contents provided in the class.
Textbooks	Class material will be handed out before each class. Other reference books, etc. are shown above.
Requisites to take subject:	Unconditional and no prerequisite
Assessment method	How much of the class contents have been understood will be evaluated by means of a report submitted in the last class.
Evaluation criteria	Pass if reports and continuous assessment of participation to practices are not less than 60%
Relevant matters	Explanations in English when overseas students are in the class

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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Fisheries and Fisheries Sciences	Semester	1
		Credits	2
Key words	Fisheries, management, aquaculture, resources		
Professor	Professor Miguel Vazquez Archdale		
Contact office	Rm. 215, Build.1		
Contact hours	After class		
Target	Students are expected to learn various subjects related to fisheries and fisheries sciences. This class aims to cover a wide range of fisheries topics, in order to give a wide exposure to technical knowledge and terminology. The class is taught in English and is suitable for international students and Japanese students with some language ability.		
Course description	This class features topics ranging from the importance of proper management of living resources for providing food security, the impacts of capture fisheries on wild fish stocks and other fauna, the importance of aquaculture in supplying food for the growing population, impacts of the fisheries industry on the environment and ecosystems, the wastage of fish as a result of post-harvest losses, and the importance of fish products on human nutrition and health. The class will be conducted remotely by ZOOM, but if "face-to-face" classes can take place the classroom will be located in the Faculty of Fisheries (Shimoarata campus)		
Schedule	<ol style="list-style-type: none"> <li>1. Introduction to the course and its requirements</li> <li>2. Demonstration of presentation techniques for research studies</li> <li>3. Introduction to Fisheries in Japan and its policy</li> <li>4. How much fish should we eat?</li> <li>5. Population growth and limited fisheries resources</li> <li>6. Anchovy: the little fish that can feed the world</li> <li>7. Is Aquaculture a solution to declining fisheries resources?</li> <li>8. Effect of fishing on marine ecosystems</li> <li>9. Post-harvest loss: ways to reduce wasting of fisheries resources</li> <li>10. Marine protected areas: natural oasis in the sea?</li> <li>11. Artificial fisheries enhancement methods</li> <li>12. Project presentations and discussion</li> <li>13. Project presentations and discussion</li> <li>14. Project presentations and discussion</li> <li>15. Project presentations and discussion and Exam</li> </ol>		
Important items:	To understand current topics in fisheries sciences and conduct a project		
Self-studies and other advices	Students should read and understand the handout, if there is one, for the next class and search in the dictionary the new vocabulary (1.5 hours).		
Textbooks	To be advised. Students will need an English/Japanese dictionary		
Requisites to take subject:	To be a Master student		
Assessment method	The level of achievement is assessed on the basis of the student's attitude and participation in the discussion and submission of exams (70%), submission of their project report (20%), and a project presentation (10%).		
Evaluation criteria	Pass if score is not less than 60%		
Relevant matters	Up-to-date Scientific English/Japanese dictionary is required		

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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Latest Analytical and Experimental Methods (Biochemistry)	Semester Credit	Summer Session 1
Key words	Protein, SDS-PAGE, Immunocytochemistry, Food proximate analysis, Gas chromatography, Mass spectrometry		
Professor	Professor Masaharu KOMATSU Professor Seiichi UNO Associate professor Kazuhiro SHIOZAKI (Coordinator) Associate professor Shota TAKUMI		
Contact office	Rm. 3-1, Build.2 (KS)		
Contact hours	After class		
Target	To let students be able to understand the principles of analysis of various chemicals and proteins for Biochemistry and Molecular biology.		
Course description	Principles of measuring devices used in Marine biochemistry researches are lectured and students have practical activities on how to use the devices.		
Schedule	<ol style="list-style-type: none"> <li>1. Gas chromatography, Mass spectrometry I</li> <li>2. Gas chromatography, Mass spectrometry II</li> <li>3. Gas chromatography, Mass spectrometry III</li> <li>4. Gas chromatography, Mass spectrometry IV</li> <li>5. Gas chromatography, Mass spectrometry V</li> <li>6. Bioinformatics for DNA and amino acid sequence analysis</li> <li>7. Theory of proteomics and chemical biology</li> <li>8. Preparation of samples for electrophoresis</li> <li>9. Sodium dodecyl sulfate electrophoresis</li> <li>10. Zymography analysis</li> <li>11. Data analysis of Protein experiments</li> <li>12. Theory of immuno-staining</li> <li>13. Preparation of cultured cell</li> <li>14. Immuno-staining with organelle-specific marker</li> <li>15. Immuno-staining analysis</li> </ol>		
Important items:	to understand the principles and handling methods of measuring devices		
Self-studies and other advices	Homework needs searching and summarizing a journal paper after a class and preparing reports for the next class.		
Textbooks	Prepared by the professor each time		
Requisites to take subject:	Unconditional and no prerequisite		
Assessment method	Analysis operation, use of measuring devices in practices, and understanding of the principle of operation are monitored, and submitted report in each item is assessed.		
Evaluation criteria	Pass if reports and continuous assessment of participation to practices are not less than 60%		
Relevant matters	Explanations in English		

## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Latest Analytical and Experimental Methods (Basic Biology)	Semester Credit	Summer Session 1
Key words	Aquaculture science and microbiology: Image analysis, measurement of size and activity, isolation and cultivation of microorganisms, microscopic observation, techniques for microbial ecology.		
Professor	Professor Tomonari KOTANI Professor Takeshi YOSHIKAWA		
Contact office	Rm 2-3, Build 5 (TK); Rm. 2-2, Build. 2 (TY)		
Contact hours	After class		
Target	To let students to be able to understand principles of aquaculture science, and microbiology including: microscopic observation; measurements of body and activity of larval fishes and zooplankton; microbial isolation, cultivation, and their related experimental equipment.		
Course description	Microbiology and aquaculture Science in the following dimensions: measurements of body and activity of larval fishes and zooplankton; microbial isolation, cultivation, observation, and their related experimental equipment.		
Schedule	<ol style="list-style-type: none"> <li>1. Outline of aquatic microbial ecology and applied microbiology (TY)</li> <li>2. Outline of molecular biological techniques applicable to aquatic microbial ecology</li> <li>3. Enumeration of microorganisms with quantitative PCR (qPCR) - Preparation of the reaction mixture (TY)</li> <li>4. Enumeration of microorganisms with quantitative PCR (qPCR) - Operation of the equipment (TY)</li> <li>5. Enumeration of microorganisms with quantitative PCR (qPCR) - Data analysis (TY)</li> <li>6. Microbial community analysis with denaturing gradient gel electrophoresis (DGGE) – PCR (TY)</li> <li>7. Microbial community analysis with denaturing gradient gel electrophoresis (DGGE) – Electrophoresis (TY)</li> <li>8. Microbial community analysis with denaturing gradient gel electrophoresis (DGGE) - Data analyses (TY)</li> <li>9. How to measure the dissolved oxygen concentration (TK)</li> <li>10. Observation of oxygen consumption of organisms (TK)</li> <li>11. How to evaluate the metabolism of organisms (TK)</li> <li>12. How to count the number of microalgae (TK)</li> <li>13. How to count the number of zooplankton (TK)</li> <li>14. Measurement of size of organisms (TK)</li> <li>15. How to use the image analysis in the measurement of organisms (TK)</li> </ol>		
Important items:	to understand the experimental procedures as well as their principles on analyzing aquatic microbial ecology.		
Self-studies and other advices	The participants should prepare the contents to be provided at the next lecture and review the provided contents or obtained experimental data.		
Textbooks	Handouts will be given at the class.		
Requisites to take subject:	Unconditional and no prerequisite		
Assessment method	Understanding level of the contents provided in the class will be evaluated based on submitted reports.		
Evaluation criteria	The degree of understanding the contents provided in the class should reach 60%.		
Relevant matters	The class will be conducted in English.		

## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	Latest Analytical and Experimental Methods (Open)	Semester Credit	Summer Session 1
Key words	Analytical chemistry, Molecular biology, Food analytical chemistry, Basic techniques for biology, Social sciences		
Professor	Professor who supervise an individual student of a member school while studying in the School of Fisheries, Kagoshima University		
Contact office	To be discussed between a supervising professor and a student		
Contact hours	After class		
Target	To obtain methods of researches in a specific field of fisheries science, which is decided by a supervising professor, taking student's interests into consideration. The supervising professor is appointed on the basis of request by a student or interests informed before coming to Kagoshima University.		
Course description	Basic principles related to analytical chemistry, molecular biology, food analytical chemistry, basic techniques for biology are widely lectured.		
Schedule	To be discussed between a host professor and student		
Important items:	Contents and topics are decided through discussion between a supervising professor and a student on the basis of student's interest		
Self-studies and other advices	Homework needs searching and summarizing a journal paper after a class and preparing for reports for the next class.		
Textbooks	Prepared by the professor		
Requisites to take subject:	Unconditional and no prerequisite		
Assessment method	Understanding level of the contents provided in the class will be evaluated based on Discussion I and II.		
Evaluation criteria	Pass if the evaluation is equal to or more than 60%.		
Relevant matters	Explanations in English		

## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	On-board Training of Oceanographic observation	Semester	2
		Credit	1
Key words	Oceanographic observation, Hydrography, Sample collections and measurements, CTD-CMS, ADCP, EPCS, FRRF, Plankton net, Data analyses		
Professor	Professor Masaki Uchiyama (Captain of Kagoshima-Maru), Professor Hirohiko Nakamura, Associate professor Toru Kobari, Assistant Professor Ayako Nishina		
Contact office	Dr. Nakamura: Rm. 202, Build.1, Dr. Kobari: Rm. 2-5, Build. 5, Dr. Nishina: Rm. 201, Build. 1		
Contact hours	During on-board training		
Target	<ol style="list-style-type: none"> <li>1. Students will develop an understanding about the workings of various measurement equipment (CTD-CMS, ADCP, EPCS, FRRF, plankton net and others) used in oceanographic observation.</li> <li>2. Students will master how to operate/use observation equipment necessary to obtain data in oceanographic observation.</li> <li>3. Students will develop an understanding of how to analyze collected data to obtain oceanographic findings.</li> </ol>		
Course description	<ul style="list-style-type: none"> <li>• Training will be conducted on Kagoshima-maru.</li> <li>• Prior to observation training, the teaching staff will explain the observation plan, measurement mechanisms of observation instruments and how to operate them.</li> <li>• During the several days they spend on board, students will conduct oceanographic observation in groups of several students.</li> <li>• The teaching staff will explain how to analyse obtained data. Students will be in charge of conducting, on board, the primary treatment of obtained data. After disembarking the ship, students will compile analysis results into a report and submit it.</li> </ul>		
Schedule	<ol style="list-style-type: none"> <li>1. The Pre-training Guidance Meeting: gives an overview of the on-board training and instructions to follow while on board, and checks if students have purchased a student education and research accident insurance policy.</li> <li>2. The tour of on-board facilities takes students to the bridge, engine room, living quarter, experiment room and deck.</li> <li>3. The Offshore Seminar 1 includes ice breaking, introduction of research contents and Q</li> <li>4. The lifesaving boat, fire drill and water drill: teaching countermeasures against emergencies such as fire or water leakage, evacuation routes from the ship, how to board a lifesaving boat.</li> <li>5. Mess hall duty: tray service and preparation of meals, dishwashing, leftover disposal</li> <li>6. Cleaning on board: cleaning the living quarters, experiment room, deck</li> <li>7. Offshore Seminar 2: schedule of oceanographic observation, where it will take place and what to observe, formulation of observation watch system</li> <li>8. Offshore Seminar 3: lectures by researchers (physics/chemistry/biology), Q</li> <li>9. Physical observation: CTD observation, ADCP observation, EPCS observation</li> <li>10. Biological observation: water sampling, plankton sampling</li> <li>11. Sample processing: seawater filtration, chlorophyll measurement, measurement of dissolved oxygen, identification and classification of marine organisms</li> <li>12. Analysis of observation data: extraction of CTD data, primary treatment, graphing</li> <li>13. Mathematical analysis of analyzed data: data input, data computation/mathematical analysis, graphing</li> <li>14. Offshore Seminar 4: general discussion (findings obtained during oceanographic observation, marine structure of the observation area, biological productivity of the observation area, Q</li> </ol>		



## 15. Writing a report

Important items:	to understand the measuring and operating principles of various devices and equipment for oceanographic observations
Self-studies and other advices	<ul style="list-style-type: none"><li>• To participate in the on-board training, it is necessary to read carefully and understand the materials provided in advance for the on-board training (about one hour).</li><li>• It is necessary to prepare, before boarding, the reference materials to be used in the on-board presentation (about two hours).</li><li>• To write a report, it is necessary to conduct a mathematical analysis on the data obtained during the training and prepare charts/graphs adequately (about one hour).</li></ul>
Textbooks	Prepared by the professor each time
Requisites to take subject:	Students have taken part in the Pre-training Guidance Meeting and developed a good understanding about the contents of the training. Students purchase a student education and research accident insurance. Students pay the cost of the on-board training.
Assessment method	The following issues are assessed. <ul style="list-style-type: none"><li>• To understand measuring and operating principles of various devices and equipment for oceanographic observations</li><li>• To be able to operate the devices and equipment, and collection of data and samples</li><li>• Effective data analyses on oceanographic observation (report or presentation)</li></ul>
Evaluation criteria	Pass if reports and continuous assessment of participation to practices are not less than 60%
Relevant matters	Explanations in English when overseas students are in the class

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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	On-board Training of Resources and Measurement Techniques	Quarter Credit	2 1
Key words	Fishing training, fishing measurement		
Professor	Associate professor YAMANAKA Yuichi Associate professor NISHI Takaaki Associate professor UCHIYAMA Masaki (Captain of T/V <i>Kagoshima-maru</i> ) Lecturer AZUMA Takafumi (Chief officer of T/V <i>Kagoshima-maru</i> ) Assistant professor FUKUDA Ryuji (First officer of T/V <i>Kagoshima-maru</i> ) Assistant professor MITUHASHI Takahisa (First officer of T/V <i>Kagoshima-maru</i> )		
Contact office	<a href="mailto:nishi@fish.kagoshima-u.ac.jp">nishi@fish.kagoshima-u.ac.jp</a> ; <a href="mailto:yamanaka@fish.kagoshima-u.ac.jp">yamanaka@fish.kagoshima-u.ac.jp</a> ; <a href="mailto:uchiyaama@fish.kagoshima-u.ac.jp">uchiyaama@fish.kagoshima-u.ac.jp</a>		
Contact hours	After class		
Target	1. Students will undergo fishing training and master the state-of-the-art technologies of fisheries resource science. 2. In addition, students will learn the workings of various analytical instruments and how to use them.		
Course description	<ul style="list-style-type: none"> <li>• Training will be conducted on Kagoshima-maru.</li> <li>• On-board lectures, and training on the bridge as well as in the experiment room and on the deck will be combined as necessary.</li> </ul>		
Schedule	<ol style="list-style-type: none"> <li>1. On-board Training Guidance Meeting and Training Outline Guidance Meeting When it is affected by covid-19, this briefing session may be put into effect in remoteness.</li> <li>2. Overview of on-board equipment</li> <li>3. Advancement of on-board information technology and on-board LAN</li> <li>4. Nautical instruments on the bridge and data processing</li> <li>5. How to analyze fishing gear movements using measurement techniques</li> <li>6. Time-series analysis of fishing gear movements</li> <li>7. Overview of underwater acoustic measurement instruments</li> <li>8. How to use a fish finder for amount measurement in fisheries resource management</li> <li>9. Summary of resource measurement of catches</li> </ol>		
Important items:	To understand the principles and handling methods of measuring devices		
Self-studies and other advices	Homework requires searching and summarizing a journal article after class and preparing its explanation for the next class		
Textbooks	Prepared by each professor		
Requisites to take the subject	Has taken the latest physical examination given by Kagoshima University. Has an accident insurance for students.		
Assessment method	Writing a report on board, examination		
Evaluation criteria	Pass if exam and reports are not less than 60%		
Relevant matters			

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## Graduate School of Agriculture, Forestry, and Fisheries, Kagoshima University

Subject title	On-board Training in Coastal Area	Semester	1,2,3,4
		Credit	1
Key words	T/V <i>Nansei-maru</i> , Fishing ground research, Fisheries stock investigation, Oceanographic observations (physical and biological)		
Professor	Faculty professors conducting onboard research Associate professor AZUMA Takafumi (Captain of T/V <i>Nansei-maru</i> )		
Contact office			
Contact hours	Anytime		
Target	<ul style="list-style-type: none"> <li>• Ocean environment surveys, ocean biology surveys</li> <li>• Fisheries resource management</li> <li>• Conservation of fishing ground environments</li> </ul> <p>With the objective of gaining the knowledge/techniques in the fields mentioned above, students will experience on-the-job training and learn techniques through various survey activities ranging from the preparation of survey instruments and alignment of equipment, to the mathematical data analysis later conducted on the ground.</p>		
Course description	<p>The training will be provided on board T/V <i>Nansei-maru</i> in Kagoshima bay and along the coast of southern Kyushu.</p> <ul style="list-style-type: none"> <li>• Ocean environment surveys, ocean biology surveys</li> <li>• Fisheries resource management</li> <li>• Conservation of fishing ground environments</li> </ul> <p>Students will conduct experiments and undergo practical training in the fields mentioned above.</p>		
Schedule	1. Faculty professors conducting onboard research and teaching staff attached to the ship will draw up experiment plans, and other such activities, and students will undergo training under the instruction/guidance of the on-board teaching staff on board T/V <i>Nansei-maru</i> .		
Important items:	to understand the handling methods of measuring instruments, and sampling methods of sea water and biological resources.		
Points to note	On the characteristics of on-boarding trainings, the practice contents and navigation days may change depending on trends in infectious diseases, weather conditions, and other factors.		
Textbooks	Prepared by the professor each time		
Requisites to take subject:	Unconditional and no prerequisite		
Evaluation criteria	Due to difficulty of scoring in each category individually, will be made a comprehensive evaluation with a 100% overall based on the following : whether a student has spent three days or more on board, or learned at least one field; and attitude /report , examination score; and the achievement in the respective fields mentioned above.		

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