NHA TRANG UNIVERSITY

1. Course information

Title	Developmental Biology for Aquatic Animals
Code	AQ501
Credit	3(2-1)
Prerequisite	No
Semester	2
Instructor	Assoc. Prof. Dr. Hung Quoc PHAM
Key words	

2. Course description

Developmental Biology for Aquatic Animals provides students knowledge and practice how aquatic animal develop from gamete to fingerlings stages. The course also help student to know how to conduct research in reproductive biology in fish and shrimp and mollusks. Beside learning from lectures, students will have to practice in labs for identifying reproductive parameters of aquatic animals

3. Objectives

To let student understand; (1) Development of aquatic animal such as fish, crustacean, mollusk, (2) Histology and embryology development, (3) research method in reproductive biology of aquatic animals

4. Learning outcomes

After completing the course, the student should be able to

1) identify developmental stages of gonad, embryonic and larval in finfish
2) Identify developmental stages of gonad, embryonic and larval in shrimp and crabs (crustacean)
3) Identify developmental stages of gonad, embryonic and larval in mollusk
4) Research method in fish reproduction

5. Content

No.	Topic
1	Finfish ・Gonadal development ・Maturation and spawning ・Embryo development ・Larval development
2	Shrimp ・Gonadal development ・Spawning ・Embryo development ・Larval development
3	Practices (Lab) ・Finfish ovary development/histology ・Fish operation/surgery ・Biological features in fish research ・Shrimp larval development (optional)

6. Teaching method

Student-centred learning: students will actively participate to all lectures to develop their own knowledge and skill through various activity from analysing case studies from scientific articles to applying the acqured knowledge to assess real aquaculture situations during the lab work.

7. References

1) Lectures handouts
2) Fish reproduction
3) Kjorsvik E., Magnor-Jensen A. and Holmefjord I., 1990. Egg quality in fishes. Advances in Marine Biology 26, 71–113.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	20

2	Seminar	30
3	Final exam	50

NHA TRANG UNIVERSITY

1. Course information

Title	Reproductive Physiology and Endocrinology
Code	AQ544
Credit	2
Prerequisite	No
Semester	2
Instructor	Dr. Hoang Minh LE
Key words	Reproductive biology, spawning season, sperm collection, sperm quality, sperm cryopreservation, sperm chilled storage, egg quality, egg collection, artificial insemination, reproductive endocrinology, aquatic animals.

2. Course description

Machanisms and functions of reproductive biology and endocrinolgy, gamete management (asseessment and cryopreservation) are explained by the lecturer. Students are requested search a journal paper relevant to the explained mechanism and function and report it.

3. Objectives

To let student understand; (1) reproductive biology and spawning season, (2) gamete (sperm and egg) quality assessment, (3) sperm chilled storage and cryopreservation, and (5) reproductive endocrinology in aquatic animals.

4. Learning outcomes

After completing the course, the student should be able to

1) Explain the mechanisms and functions of reproductive biology and endocrinology
2) Analyze and assessment the sperm and egg quality of aquatic animals
3) Cryopreservation of sperm for short- or long-term of aquatic animals
4) Application in artifical insemination of aquatic animals

5. Content

No.	Topic
1	General Introduction
2	Reproductive Biology in Aquatic Animals
3	Semen Property in Aquatic Animals
4	Spermatozoa Motility in Aquatic Animals
5	Semen Cold Storage in Aquatic Animals
6	Semen Cryopreservation in Aquatic Animals
7	Dead Fish Semen Cryopreservation
8	Fish Reproductive Endocrinology
9	Overall discussion

6. Teaching method

Handout and books are prepared and introduced by the lecturer and students have to find relevant journal papers and books.

Homework needs searching and summarizing journal papers and preparing for reporting on all items of 15 lectures.

7. References

1) Elsa Cabrita, Vanesa Robles, Paz Herraez. Methods in Reproductive Aquaculture: Marine and Freshwater Species. August 22, 2008 by CRC Press - 572 Pages.
2) Robert J. Wootton, Carl Smith. Reproductive Biology of Teleost Fishes. October 2014, Wiley-Blackwell - 496 pages.
3) David O. Norris, Richard E. Jones. Hormones and Reproduction in Fishes, Amphibians, and Reptiles. 1987 by Springer US – 613 pages.
4) Reinecke M, Giacomo Zaccone, Kapoor B.G. Fish Endocrinology (2 Vols.). January 5, 2006 by CRC Press - 912 Pages

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Midterm exam	20
2	Seminar	20

3	Final exam	60

NHA TRANG UNIVERSITY

1. Course information

Title	Fish Nutrition & Aqua-feeds
Code	AQ545
Credit	3(2-1)
Prerequisite	N/A
Semester	Summer session
Instructor	Dr. Tuan Anh LE
Key words	Fish, Nutrition, Feed.

2. Course description

The course includes 9 topics covering General fish nutrition; Nutritional requirements of tropical finfishes and crustaceans; Assessment of potential feed ingredients; Feed formulation, manufacture and management; Feeding strategies; Analytical techniques and Research methods.

3. Objectives

The course provides the students with basic knowledge of fish nutrition and nutritional requirements of some important tropical finfishes and crustaceans; help the students know how to assess potential feed ingredients; how to make a feed formulation, manufacture and management; and know feeding strategies. Finally, the students will also be provided with common analytical techniques and research methods related to fish nutrition and aqua-feeds.

4. Learning outcomes

After completing the course, the student should be able to have

1) A general understanding of the importance of feeds and feeding in aquaculture, the influence of nutrients and additives in maintaining the health of farmed fish, the requirements of macro and micronutrient of fish and shrimp; and the relevant metabolic processes and energetics.
2) An overview of natural feeds and integrated aquaculture, and artificial feeds including feed ingredients, formulation, manufacture, management, and feeding strategies.
3) General knowledge of analytical techniques and nutrition research methods.

5. Content

No.	Topic
1	Introduction to fish Nutrition: type and function of nutrients; physiology of digestion; nutritional pathology and role of nutrients in fish health; nutritional biochemistry.
2	Nutritional requirements: fundamental issues; nutritional requirements of fish (carp, tilapia, milkfish; Asian seabass, grouper) and crustacean (shrimp, lobster).
3	Assessment of potential feed ingredients: status of use and efforts to reduce use of trash fish in aquaculture; feed ingredient selection; nutritive value of feed ingredients; fish meal replacement;
4	Introduction to feed formulation: science and art of diet formulation; methods of formulating diets (+ practical assignment).
5	Feed manufacture: - farm-made and lab feeds: fundamentals of making pelleted dry/moist diets (+ practical assignment); - commercial feeds: pelleting and extrusion (+ company visit (if available)).
6	Feed management: storage; quality management systems.
7	Feeding strategies: introduction; feeding practices for fish and shrimp.
8	Analytical techniques: introduction to nutritional analysis; methods and interpretation (+ lab visit).
9	Research methods: introduction to experimental design and statistical analysis; statistic rigor and Power analysis; determining nutrient requirements (using empirical methods and a factorial approach); experimental system; methods for ingredient evaluation; experimental protocols.

6. Teaching method

There will be three blocks of teaching during the semester. Each block extends over 3 days and includes approximately 15 hours of teaching. In addition, there will be laboratory classes/practical assignments/field trip (of approximately 15 hours).
Mode of delivery: Face-to-face teaching.

7. References

1) Fish Nutrition. Edited by Halver, J.E. and Hardy R.W. Academic Press, 1972
2) Nutrient Requirements of Fish. National Research Council, The National Academies Press, Washington, D.C., 1993.
3) Crustacean nutrition (Edited by Louis R. D'Abramo, Douglas E. Conklin and Dean M. Akiyama, The World Aquaculture Society, ISBN 1-8888-07-00-8), 1997.
4) Standard methods for the nutrition and feeding of farmed fish and shrimp. Albert G.J. Tacon, Argent Laboratories Press, Redmond, Washington U.S.A., 1990
5) Nutrition and Feeding of Fish and Crustaceans. Edited by Guillaume, J., Kaushik, S., Bergot, P. and Métailler, R. Praxis Publishing, ISBN 1-85233-241-7, 1999.
6) Nutrient Requirements and Feeding of Finfish for Aquaculture. Edited by Webster, C.D., Lim, C. CABI Publishing, ISBN 0-85199-519-5, 2002.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Assignments (2)	30
2	Seminar	20
3	Final exam	50

NHA TRANG UNIVERSITY

1. Course information

Title	Fish Stock Assessment
Code	AQ546
Credit	2
Prerequisite	No
Semester	2
Insstructor	Dr. Anh Lam NGUYEN
Key words	Fisheries resources utilization, stock assessment and management, fishing effort, biological reference points

2. Course description

Provide the knowledges of fisheries resources management relating to the impacts of human activities, the dynamic of fish stock, and the methods of fish stock assessment.

3. Objectives:

The importance role and methods of fish stock assessment to provide biological reference points for sustainable fisheries management

4. Learning outcomes

After completing the course, the student should be able to

1) Estimate the growth parameters and mortality rates of fish
2) Estimate the fish biomass and predict the maximum sustainable yield (MSY)
3) Propose the biological reference points for fisheries sustainable management

5. Content

No.	Topic
1	Introduction 1.1. Fisheries utilization 1.2. Fisheries management 1.3. Fish stock assessment
2	Fish population dynamic 2.1. The concept of population 2.2. Cohort 2.3. Fish stock 2.4. Biological reference points
3	Fish stock assessment methods 3.1. Swept area method 3.2. Acoustic method 3.3. Tagging method 3.4. Remote sensing and GIS method 3.5. Age-based and length-based fish stock assessment models

6. Teaching method

Flexibilily including lecture note, practice and group discussion

7. References

1) Sparre P., Venema S. C., 1992. Introduction To Tropical Fish Stock Assessment. Part Manual. FAO Fisheries Technical Paper 306/1
2) Sparre P., Venema S. C., 1992. Introduction To Tropical Fish Stock Assessment. Part 2 Exercises. FAO Fisheries Technical Paper 306/2
3) Michael King, 2007. Fisheries Biology, Assessment and Management. Wiley-Blackwell
4) Gallucci V. F., Saila S. B., Gustafson D. J., Rothschild B. J, 1996. Stock assessment: quantitative methods and applications for small-scale fisheries. CRC Pres
5) Malcolm Haddon, 2001. Modeling and quantitative methods in fisheries. Chapman&Hall/CRC

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Class attendance/attitude	10
2	Practice	20
3	Seminar (group presentation)	20
4	Final exam	50

NHA TRANG UNIVERSITY

1. Course information

Title	Ecology and Applications in Tropical Aquaculture: Environmental Friendly and Sustainable Perspective
Code	AQ547
Credit	2
Prerequisite	No
Semester	1
Instructor	Dr. Khuong Van DINH
Key words	Tropical fish, shrimp, tropical aquaculture, Penaeus monodon, Pangasius, Tilapia, climate change, global warming, ocean acidification, environmental issues, sustainable aquaculture, overuse of antibiotics, algal bloom, aquatic ecology

2. Course description

Ecology of cultured species in tropical regions will be introduced by the lecturer. Various aspects of ecological-related issues in tropical aquaculture will also be analyzed. Theory and application of environmental friendly and sustainable aquaculture will be discussed with abundant evidence of case studies from the latest scientific publications.

3. Objectives

To let student understand; (1) ecology of cultured species in tropical regions, (2) tropical aquaculture under global climate change, (3) tropical aquaculture and environmental issues, (4) sustainable aquaculture in tropical region.

4. Learning outcomes

After completing the course, the student should be able to

1) Understanding ecology of tropical species in aquaculture
2) Help to solve aquaculture-related issues in tropical regions
3) Practicing aquaculture in environmental friendly and sustainable manner.

5. Content

No.	Topic
1	Introduction
2	Ecology of cultured species in tropical regions with focuses on Pangasius, tilapia and other marine species.
3	Ecology of invasive species in aquaculture in tropical regions
4	Aquaculture under global climate change: global warming, ocean acidification, toxic algal bloom,
5	Tropical aquaculture and environmental issues: eutrophication, overuse of antibiotics and chemical products, solid wastes from tropical aquaculture.
6	Environmental friendly and sustainable aquaculture: theory of sustainable development and applications in aquaculture. Case studies of sustainable aquaculture in tropical countries.
7	Field trips to aquaculture farms in Vietnam: Nha Trang area and Mekong river delta.
8	Overall discussion and report.

6. Teaching method

Student-centred learning: students will actively participate to all lectures to develop their own knowledge and skill through various activity from analysing case studies from scientific articles to applying the acqured knowledge to assess real aquaculture situations during the field trips.

7. References

1) Handout is prepared by the lecturer for all lectures
2) Scientific articles will be provided as case studies for student at each lecture

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	20
2	Seminar	20
3	Final exam	60

NHA TRANG UNIVERSITY

1. Course information

Title	Genetics in Aquaculture and Fisheries
Code	AQ519
Credit	2
Prerequisite	No
Semester	1
Instructor	Minh Van Nguyen
Key words	Phenotype, genotype, dominant, recessive, inheritant, heritability, allele, loci, selection, qualitative trait, quantitative trait.

2. Course description

The course introduces theory of quantitative and population genetics that are applied in aquaculture and fisheries, and focus on methods in traditional genetic improvement programs, genetic engineering, and other genomic manipulations for genetic enhancement of aquatic organisms.

3. Objectives

The course will present basic concepts of inheritant modes in aquatic animals; molecular markers and applications in population genetics, in aquaculture and fisheries; methods for genetic improvement in selective breeding programs; genetic engineering, and other genomic manipulations for genetic enhancement of aquatic organisms; and possible effects of escapees from aquaculture and transgenic animals on wild populations and ecosystems.

4. Learning outcomes

After completing the course, the student should be able to

1) Reinforce basic knowledge on the genetic regulatory mechanisms, fish population genetics, quantitative genetics.
2) Have good knowledge of the principles and applications of molecualr genetic tools used in aquaculture and fisheries.
3) Design genetic enhancement programs to improve performances for economically important traits of fishes and other aquatic organisms.
4) Collect and analyze data from genetic enhancement programs and molecular-based studies in aquaculture and fisheries.

5. Content

No.	Topic
1	Basic genetics 1.1 Chromosomes and genes 1.2. Modes of inheritance 1.3 Medelian inheritance 1.4. Polygenic traits 1.5. Genetic variation at the molecular levels 1.6 Genetics of population and stocks
2	Genetic markers used in aquaculture and fisheries 2.1 Allozyme and mitochondrial DNA markers 2.2 Restriction fragment length polymorphism (RFLP) 2.3. Randomly amplified polymorphic DNA (RAPD) 2.4. Amplified fragment length polymorphism (AFLP) 2.5. Microsatellite markers 2.6. Single Nucleotide Polymorphism (SNP) 2.7. Application of DNA Markers for Population Genetic Analysis
3	Quantitative genetics 3.1. Quantitative genetics 3.2. Variance in phenotype 3.3. Genetic variation and interaction 3.4. Heritability
4	Selective breeding and hybridization 4.1. Genetic principles underlying selective breeding in aquaculture 4.2. Breeding objectives in aquaculture 4.3. Marker-Assisted selection for aquaculture species 4.4. Main methods for selection porgrams in aquaculture

	4.5. Inbreeding, crossbreeding 4.6. Hybridization 4.7. Maintenance of Genetic Quality of Broodstock
5	Chromsome manipulations 5.1. Polyploidy 5.2. Gynogenesis and androgenesis 5.3. Sex reversal and breeding
6	Gene manipulations 6.1. Basic concepts on gene manipulation 6.2. Gene-transfer technology 6.3. Genome expression analysis technologies
7	Genetics issues in fisheries management 7.1. The genetics and fitness of hatchery stocks 7.2. Impacts of the genetics of wild stocks 7.3. Evironmental effects of escapees and transgenic animals

6. Teaching method

Teaching language is English. Teaching methods include lecturing and discussions. Lectures are presented in PowerPoint slides incorporated with board drawing when needed. Reasoning questions will be asked during lecturing, which help students develop active thinking Excecises will be given and evaluations regularly done.

7. References

1) Foulkes S. N. (2016) Advances in Genetics: Genetics, Genomics and Fish Phenomics Saint Louis, US- Elsevier Science. 262 p.
2) Dunham A. R. (2011) Aquaculture and fisheries biotechnology: Genetic Approaches. 2nd Ed. CABI Publishing. 506 p.
3) Beaumont A., Boudry P., Hoare K. (2010) Biotechnology and genetics in fisheries and aquaculture. 2nd Ed. Wiley-Blackwell. 193 p.
4) Liu J.Z. (2007) Aquaculture Genome Technologies. Blackwell Science. 546 p.
5) Relavent papers from peer-reviewed pulications

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	30
2	Seminar	30
3	Final exam	40

NHA TRANG UNIVERSITY

1. Course information

Title	Aquatic Raw Material Handling and Processing Technology
Code	SPT510
Credit	2
Prerequisite	No
Semester	Summer Session
Instructor	Assoc. Prof. Dr. Tuan A. NGUYEN & Dr. Nga T.Tuyet MAI
Key words	Aquatic raw material, handling, processing

2. Course description

Post-harvest changes of aquatic raw materials, and engineering principles of unit operations are explained by the lecturer. Students are requested to search a journal paper relevant to their assignment and report it.

3. Objectives

To let student understand: (1) chemical and biochemical changes which can occur during processing and which can influence the functional properties of the possible end properties, (2) specific product and process related factors in the processing of aquatic food products, (3) how aquatic food products are industrially processed, various ways of designing and monitoring processing chains with the emphasis on how quality, safety, authenticity, etc. of raw materials and products are preserved.

4. Learning outcomes

After completing the course, the student should be able to

1) Explain the quality changes of aquatic raw materials
2) Understand how post-harvest handling influence the quality of aquatic raw materials
3) Understand how food products are industrially processed, various ways of designing and monitoring processing chains with the emphasis on how quality, safety, authenticity, etc. of raw materials and products are preserved

5. Content

No.	Topic
1	The economic importance of aquatic raw materials and food products
2	The anatomy of aquatic raw materials
3	The chemical composition of aquatic raw materials
4	Postharvest handling and quality changes of aquatic raw materials
5	Processing technologies for aquatic raw materials
6	Quality aspects of food products based on aquatic raw materials (enzymes, color, texture, structure, etc...)
7	Health aspects of aquatic raw materials and food products

6. Teaching method

Demonstration, lectures, guided self-study, group work, seminar.

7. References

1) Huss H. H. (1995). Quality and quality changes in fresh fish. FAO Fisheries Technical Paper – 348. Rome, Italy.
2) Martin A.M. (1994). Fisheries processing. Chapman & Hall. London, UK.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	15
2	Seminar	15
3	Final exam	70

NHA TRANG UNIVERSITY

1. Course information

Title	Technology of Traditional Aquatic Products
Code	SPT511
Credit	2
Prerequisite	No
Semester	Summer Session
Instructor	Dr. Huong T. My NGUYEN
Key words	Traditional fermented fishery products, fish sauce, shrimp paste, fermented shrimp, hydrolysis of protein, lactic acid fermentation.

2. Course description

The course provides knowledge related to the traditional fermented fishery products such as fish sauce, shrimp paste and fermented shrimp. Enzymatic hydrolysis of protein, lactic acid fermentation, production process, chemical composition and factors affecting the quality of traditional fermented fishery products are presented.

3. Objectives

To let the students understand the enzymatic hydrolysis of protein and lactic acid fermentation during production of traditional fermented fishery products; the production process of fish sauce, shrimp paste and fermented shrimp.

4. Learning outcomes

After completing the course, the student should be able to

1) know the types of traditional fermented fishery products
2) understand the enzymatic hydrolysis of protein and lactic acid fermentation during production of traditional fermented fishery products
3) know how to produce the fish sauce, shrimp paste and fermented shrimp
4) analyze the factors affecting the quality of fish sauce, shrimp paste and fermented shrimp.

5. Content

1	Traditional fermented fishery products 1.1 Introduction 1.2 Types of traditional fermented fishery products 1.3 Some of traditional fermented fishery products in Asian countries
2	Fish sauce 2.1 Enzymatic hydrolysis of fish protein during production of fish sauce 2.2 Color, odor and taste of fish sauce 2.3 Production process of fish sauce 2.4 Chemical composition and nutritive value of fish sauce 2.5 Factors affecting fish sauce quality
3	Shrimp paste 3.1 Enzymatic hydrolysis of protein during production of shrimp paste 3.2 Production process of shrimp paste 3.3 Chemical composition of shrimp paste 3.4 Factors affecting shrimp paste quality
4 4.1	Fermented shrimp 4.1 Lactic acid fermentation and hydrolysis of protein during production of fermented shrimp 4.2 Production process of fermented shrimp 4.3 Factors affecting fermented shrimp quality

6. Teaching method

Demonstration, lecture, guided self-study, group work, seminar.

7. References

1) Hui Y.H. (2012). Handbook of animal-based fermented food and beverage technology. CRC Press. Taylor & Francis group.
2) Martin A.M. (1994). Fisheries processing. Chapman & Hall. London, UK.
3) Lee C.H, Steinkraus K.H, Reilly P.J.A. (1993). Fish fermentation technology. United Nations University Press.
4) Jiang J.J., Zeng Q.X., Zhu Z.W., Zhang L.Y. (2007). Chemical and sensory changes associated Yu-lufermentation process - A traditional Chinese fish sauce. Food chemistry, 104(4): 1629-34. Yongsawatdigul J., Rodtong S., Raksakulthai N. (2007). Acceleration of Thai fish sauce

fermentation using proteinases and bacterial starter cultures. Food Science, 72 (9):382-90.
5) Lopetcharat K., Choi Y.J., Park J.W., Daeschel M.A. (2001). Fish sauce products and manufacturing: A review. Food Reviews International, 17:65-88.
6) Park J.N., Fukumoto Y., Fujita E. (2001). Chemical composition of fish sauces produced in Southeast and East Asian countries. Food Composition and Analysis, 14: 113-25.
7) Park J.N, Watanabe T., Endoh K.I, Watanabe K., Abe H. (2002). Taste-active components in a Vietnamese fish sauce. Fisheries Science., 68(4): 913-20.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	25
2	Seminar	25
3	Final exam	50

NHA TRANG UNIVERSITY

1. Couse information

Title	Risk Analysis in the Agri – Food Chain
Code	FOT516
Credit	3
Prerequisite	No
Semester	2
Instructor	Dr. Anh Thuan NGUYEN
Key words	hazard identification, hazard characteristic, exposure assessment, (4) risk characteristic, Risk Analysis

2. Course description

The steps of risk assessment in the risk analysis in the agri – food chain are explained by the lecturer. Students are requested perform the consumption survey, calculate the exposure and conclude about the risk characteristic.

3. Objectives

To let student understand; (1) hazard identification, (2) hazard characteristic, (3) exposure assessment, (4) risk characteristic, and (5) Risk Analysis

4. Learning outcomes

After completing the course, the student should be able to

1) Hazard identification
2) Hazard characteristic
3) Exposure assessment
4) Risk characteristic
5) Risk Analysis

5. Content

No.	Topic
1	Risk assessment of chemical contaminants in food products 1.1 General frame work of a chemical risk assessment 1.2 Hazard inventarisation: what causes an adverse health effect in food products? 1.3 Hazard characterization 1.3.1 Different toxic effects 1.3.2 Dose – Response relations 1.4 Exposure assessment 1.4.1 Deterministic risk assessment 1.4.1.1 Introduction 1.4.1.2 Exercise 1.4.2 Probabilistic risk assessment 1.4.2.1 Exercise acrylamide 1.4.2.2 Exercise intake of fumonisines
2	Microbiological aspects of risk assessment 2.1 Introduction 2.2 Microbiological risk assessment 2.2.1 Hazard identification 2.2.2 Exposure assessment 2.2.3 Hazard characterization 2.2.4 Risk characterization 2.3 Examples 2.4 Exercise 2.4.1 Deterministic risk assessment exercise 2.4.1.1 Input of data 2.4.1.2 Questions 2.4.1.3 Remark 2.4.2 Probalistic risk assessment
3	Risk assessment of presticide residues 3.1 Methodology of presticide residues 3.2 Exposure information 3.2.1 Pattern of use

	3.2.2 Exposure potential

6. Teaching method
   Seminar, workshop, lecture

7. References

1) Sumner J, Ross T, Ababouch L. Application of risk assessment in the fish industry. FAO Fisheries Technical Paper. No. 442. Rome, 2004. 78p. http://www.fao.org/docrep/007/y4722e/y4722e00.HTM
2) Feinberg M, Bertail P, Tressou J, Verger Ph. Analyse des risques alimentaires. Paris: Techniques & Documentation, 2006, 398p.
3) Ronald H. Sch, GARY E. R., Food Safety Handbook, Wiley-Interscience, 2003
4) FAO/WHO. Consultations and workshops: dietary exposure assessment of chemicals in food: report of a joint FAO/WHO consultation, Annapolis, Maryland, USA, 2-6 May 2005. Issued by the World Health Organization in collaboration with the Food and Agriculture Organization of the United Nations, WHO Press, Switzerland, 2008, 88p. http://whqlibdoc.who.int/publications/2008/9789241597470_eng.pdf
5) Parent-Massin D. Principes d'évaluation du risque chimique en sécurité alimentaire. EMC (Elsevier Masson SAS, Paris), Pathologie professionnelle et de l'environnement, 16-065-A-15, 2009.
6) Renwick AG, Barlow SM, Hertz-Picciotto I, Boobis AR, Dybing E, Edler L, Eisenbrand G, Greig JB, Kleiner J, Lambe J. Risk characterisation of chemicals in food and diet. *Journal Food and Chemical Toxicology*, 2003, 41, p.1211–1271.
7) Thompson FE, Byers T. Dietary assessment resource manual, *Nutrition*, 1994, 124, p. 2245S-2317S.
8) WHO (World Health Organization). Guidelines for the study of dietary intakes of chemical contaminants. Geneva, WHO, Offset publication n° 87, 1985, 102p

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	15%
2	Seminar	25%
3	Final exam	60%

NHA TRANG UNIVERSITY

1. Course information

Title	Bioactive Compounds from Marine Resources
Code	BIO514
Credit	2
Prerequisite	No
Semester	2
Instructor	Dr. Bao Nguyen Duy HUNH
Key words	Extraction techniques, Screening approach, Bioactive compounds, Marine resources

2. Course description

Different approaches and methods for bioactive compounds from marine resources are explained by the lecturer. Students are requested search a journal paper relevant to the explained their assignment and report it.

3. Objectives

This course is designed to let students be aware of the need for efficient use of bioactive compounds from marine resources and let them acknowledge the problem.

4. Learning outcomes

After completing the course, the student should be able to understand

1) Overview of marine bioactive compounds
2) Screening approach for bioactive compounds
3) Extraction techniques for bioactive compounds
4) Applications of marine bioactive compounds

5. Content

No.	Topic
1	Introduction
2	Screening of bioactive compounds from marine resources
3	Structure and properties of bioactive compounds from marine resources
4	Extraction techniques for bioactive compounds isolation from marine resources
5	Applications of bioactive compounds from marine resources
6	Overall discussion

6. Teaching method

Lecture and seminar

7. References

1) Bhakuni D.S., Rawat D.S. (2005). Bioactive Marine Natural Products. Springer Publisher. 400 p.
2) Baroww C., Shahidi F. (2002). Marine Nutraceuiticals and Functional Foods. CRC Press. 494p.
3) Steven M. Colegate, Russell J. Molyneux. (2008). Bioactive Natural Products. CRC Press. 624p.
4) Hiromasa Kiyota. (2006). Marine Natural Products. Springer Publisher.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	0
2	Seminar	40
3	Final exam	60

NHA TRANG UNIVERSITY

1. Course information

Title	Marine Bioactive Compounds
Code	BIO507
Credit	2
Prerequisite	Advanced Biochemistry
Semester	1
Instructor	Assoc. Prof. Dr. Nghia Dang NGO Dr. Bao Nguyen Duy HUYNH
Key words	

2. Course description

This course support to students the knowledge of marine compounds that have beneficial effects to health, including anti-ageing, protecting the body from chronic diseases such as obesity, hypertension, osteoporosis, cancer, cardiovascular, arthritis. The course covers different aspects that are marine resource as fish, crustacean, mollusks, algae, microalgae, microorganism; extraction of bioactive compounds; health beneficial effects and commercial sector.

3. Objectives

This course aims to make the students recognize the important of marine resource through the bioactive compounds, understand the technology of extraction and purification, and apply in nutrition and health protection.

4. Learning outcomes

After completing the course, the student should be able to

1) Distingue the marine animals and plants that can be used in extraction of bioactive compounds
2) Understand the different marine bioactive compounds that have health beneficial effects and their mechanism operations in the human body.
3) Make the layout of technology for processing of some main marine bioactive compounds.
4) Design the experiment to estimate the bioactivities of these compounds.
5) Know the market and commercial aspects of marine bioactive compounds.

5. Content

No.	Topic
1	Marine resource General oceanographics, marine animals, plants, microorganism. World marine capture situation Specific species in marine
2	Fish protein hydrolysate and bioactive peptides By-products in seafood processing Fish protein hydrolysate and health benefits Bioactive peptides, hydrolysate collagen and application
3	Fish oil and carotenoids Fish oil, carotenoids: isolation and applications
4	Marine Polysaccharides Alginate, chitin/chitosan and applications
5	Marine algae and microalgae Marine algae extract and health effects Microalgae and application
6	Marine enzymes from extrophiles Marine enzymes from bacteria living in extreme conditions as very low/high temperature, high pressure and applications

6. Teaching method

7. References

1) Vazhiyil Venugopal Ed., (2009). Marine Products for Healthcare: Functional and Bioactive Nutraceutical Compounds from the Ocean. CRC Press.
2) Yves Le Gal, Roland Ulber Ed., (2005). Marine Biotechnology I &II. Springer.
3) Se-Kwon Kim Ed Ed. (2013). Marine nutraceuticals: Prospects and Perspectives. CRC Press.
4) Se-Kwon Kim Ed Ed. (2013). Marine Biomaterials: Characteristics, Isolation and Applications

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Midterm Assessment	25
2	Final examination	75

NHA TRANG UNIVERSITY

1. Course information

Title	Ecology and Climate Change
Code	BIO510
Credit	2
Prerequisite	No
Semester	Summer
Instructou	Dr. Binh Thuy DANG
Key words	Ecology, climate change

2. Course description

This course provides basic knowledge about the marine ecosystem to use the concept of populations, communities and ecology through the understanding of the distribution and diversity of organisms including abiotic conditions, organic matter and nutrient cycling, competition, predation, and human impact. The module also provides an overview of climate change (the overall concept, the expression and the phenomenon of climate change), climate change in Vietnam and globally, causes, events and predictions scenarios of climate change in the future; the impact of climate change, vulnerable communities and ecosystems, in order to manage and protect the ecosystem, mitigate and adapt to the impacts of climate change

3. Objectives

This course provides an overview of the ecology and climate change, the vulnerability of ecosystems under the impact of climate change, the climate change scenarios; through which students can apply the knowledge of ecology and climate change in the areas of management and protection of natural resources, protection of biodiversity in order to use these ecosystems in a sustainable way.

4. Learning outcomes

1) After completing the course, the student should be able to
Understand the general knowledge about the ecology and climate change
2) Recognize ecosystems and the ecological relationships in marine environment
3) Applying the knowledge of ecology and climate change in the management and protection of natural resources, biodiversity conservation in order to use these ecosystems in a sustainable way
4) Knowledge and skills to engage and communication on climate change, conserve biodiversity and marine ecosystems.

5. Content

No.	Topic
1	The basic concept of ecology Environmental and ecological factors Populations and biomes Research methods of ecology
2	Ecological system Concepts The structure of the ecosystem The marine ecosystem Ecological communities The ecosystem interactions
3	Climate change The concept Expression, phenomena and climate change Climate change in Vietnam and globally Causes, development, and scenarios of climate change
4	The impact of climate change on ecosystems The impact of climate change on flora and fauna The ability of organisms to adapt to climate change The impact of climate change to species interactions, communities and ecosystems
5	Climate change and conservation Climate change for the conservation and restoration of resources, climate change landscape for conservation and management of biodiversity and ecosystems Adapting to climate change for biodiversity and ecosystem

6. Teaching method
The course include
Theory lecturers
Group working (report and seminar)

7. References

1) Eric Post. 2013. Ecology of Climate Change: The Importance of Biotic Interactions. Princeton University Press.
2) Frontiers in Ecology and the Environment. Special Issue: Impact of climate change on biodiversity, ecosystems, and ecosystem service. Volume 11(9). The Ecological Society of America. November, 2013.
3) Martin J Attrill, Simon Jennings, David N Thomas, David K. A. Barnes. 2011. Marine Ecology: Processes, Systems, and Impacts. Oxford University Press, 21-07-2011 - 501 trang
4) Houghton, John Theodore biên tập (2001).“Appendix I – Glossary”. Climate change 2001: the scientific basis: contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press. ISBN 0-521-80767-0.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Midterm Examination	15
2	Group Presentation/report	25
3	Final examination	60

NHA TRANG UNIVERSITY

1. Course information

Title	Marine Biodiversity
Code	BIO503
Credit	2
Prerequisite	No
Semester	1
Instructor	Dr. Binh Thuy DANG
Key words	

2. Course description

Vietnam has one of the world's most diverse marine biologic systems. This biodiversity feeds and supports not only local communities within Vietnam, but, a growing international export market, as well. The marine ecosystems of Vietnam are also at risk for loss of biodiversity due to climate change. With the risk due to both climate change and increased in exploitation of the marine system to support both local and international markets, it is imperative to understand not only the biodiversity that exists, but, the ecology and ecosystems that support it. This course gives a basic introduction to Marine Ecology and Biodiversity, emphasising on selected tropical and subtropical communities (e.g. interactions between marine plants and/or animals), organisms and habitats. The organisms will be described on the basis of their ecological adaptations, and examples from different local geographical areas will be given. Samples will be collected from local sites during the course and examined and analysed in the laboratory

3. Objectives

This course will provide basic concepts necessary to understand marine biodiversity with specific examples of Vietnamese marine biodiversity, especially in the central region. Through lectures and field activities and discussing with experts, students will understand basic specialist knowledge on tropical biodiversity, including concepts such as marine ecology, marine creature biology, marine biodiversity conservation and so on.

4. Learning outcomes

After completing the course, the student should be able to

1) Describe the development the major concepts of marine biodiversity and the major patterns of marine biodiversity
2) Be familiar with the basic principles of taxonomy and be able to distinguish the main groups of organisms
3) Know how marine biodiversity is measured and be able to analyse the marine biodiversity of selected marine habitats over different scales
4) Be familiar with the major ecological processes that define the different marine ecosystems
5) Be familiar with the factors which control patterns of marine biodiversity
6) Gain an understanding of the key conservation issues for marine biodiversity

5. Content

No.	Topic
1	General introduction to marine biodiversity concept, value, evolution theory, species and ecosystem diversity
2	Ecological principles of Marine Biology
3	Biodiversity and Evolution Darwin Evolution theory, evolution and adaptation, speciation, extinction
4	Marine organisms Prokaryota and Eukaryota, marine invertebrate and invertebrate Common taxonomic system
5	Marine Ecosystem concept, ecological interaction, marine ecosystem (Coral reef, marine soft bottom and mangrove forest system
6	Value and the decline of marine biodiversity Survey and evaluation methods, Current status and cause
7	Marine biodiversity conservation The principle of conservation in marine biodiversity, Populations and biosphere Conservation, In situ and Ex situ Conservation, Conservation and Sustainable Development

6. Teaching method
7. References

1) Marine Ecology: Processes, Systems, and Impacts, Second Edition. 2011. Michel J Kaiser, Martin J Attrill, Simon Jennings, David N Thomas, David K. A. Barnes, Andrew S. Brierley, Jan G. Hiddink, Hermanni Kaartokallio, Nicholas V. C. Polunin, and David G. Raffaelli. 528 pp. ISBN 978-0-19-922702-0 http://ukcatalogue.oup.com/product/9780199227020.do#
2) Marine Biology (Function, Biodiversity, Ecology), Fourth Edition, Jeffrey S. Levinton. Oxford University Press. ISBN: 9780199857128
3) Allendorf F., Luikart G, 2006. Conservation and the Genetics of Populations. Blackwell Publishing. 642 pp
4) Gaston KV., Spicer JI. 2006. Biodiversity: an Introduction. Blackwell Publishing. 191 pp.
5) Page, R.D.M., Holmes, E.C. 1998. Molecular Evolution. Blackwell Publishing. 346 pp

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Midterm Examination	15
2	Group Presentation/report	25
3	Final examination	50

NHA TRANG UNIVERSITY

1. Course information

Title:	Probiotic Technology in Aquaculture and Food Production
Code	BIT506
Credit	2
Prerequisite	No
Semester	2
Instructor	Assoc. Prof. Dr. Duy Van NGUYEN
Key words	Probiotics, Prebiotics, Synbiotics, Microbiology, Aquaculture, Food Production, Veterinary Medicine, Animal Health, Diseases of Aquatic Organisms, Gut Microbiota

2. Course description

This lecture supports basic knowledge in “good” microorganisms (probiotics) and their mode of actions to improved human and animal health, engineering processes for the production of probiotic products from microorganisms and their applications in food production, veterinary medicine and aquaculture health.

3. Objectives

To let students to obtain basic knowledge and skills for the development of probiotic products from microorganisms for their applications in food production, veterinary medicine and aquaculture health.

4. Learning outcomes

After completing the course, the student should be able to

1) Explain the relationship between animal health and gut microorganisms
2) Join into manufacture process of probiotics products applied in food production, livestock, medicine and aquaculture
3) Apply in farming of some important marine animals

5. Content

No.	Topic
1	Introduction
2	Scientific basis of probiotic technology: the role of gut microbiota on human and animal health, taxonomy of probiotic microorganisms, modes of action on health, safety
3	Manufacture of probiotic microorganisms: isolation and selection, growth media and conditions, fermentation methods, drying strategies, storage and dehydration
4	Applications of probiotics from microorganisms for marine fish, crustaceans and molluscs
5	Practice to check student’s understandings of important items

6. Teaching method

- Lecture in class
- Discussion and seminar
- Homework needs reading documents distributed before a class, and preparing for answering some problems provided in the last day.

7. References

1) Nguyen Van Duy (2016). “Marine glycans in relationship with probiotic microorganisms to improve human and animal health”. In: Se-Kwon Kim (ed.), “Marine Glycobiology: Principles and Applications”, CRC Press.
2) Nguyen Van Duy (Editor). Le Dinh Duc, Nguyen Thi Kim Cuc, Pham Thu Thuy, Le Phuong Chung (2015): Probiotic Technology. Science and Technique Publisher, Hanoi. (In Vietnamese)
3) Nguyen Van Duy, Le Minh Hoang, Trang Si Trung (2013). Application of probiotics from marine microbes for sustainable marine aquacuture development. In: "Marine Microbiology: Bioactive Compounds and Biotechnological Applications" (Kim, edi.), Weinheim: Wiley-VCH, pp. 307-349.
4) Nguyen Van Duy (2011). Marine bacteriocin as a new drug for aquaculture health. Journal of Fisheries Science and Technology, 4: 182-187.
5) Dimitris Charalampopoulos, Robert A. Rastall (2009). Prebiotics and Probiotics Science and Technology. Springer Publishing.
6) Yuan Kun Lee, Seppo Salminen (2008). Handbook of Probiotics and Prebiotics. Wiley-Interscience.
7) Susan Sungsoo Cho and E. Terry Finocchiaro (2010). Handbook of prebiotics and probiotics ingredients: health benefits and food applications. CRC Press.

8) Desriac F, D Defer, N Bourgougnon, B Brillet, P Le Chevalier and Y Fleury, 2010. Bacteriocin as Weapons in the Marine Animal-Associated Bacteria Warfare: Inventory and Potential Applications as an Aquaculture Probiotic. Mar Drugs, 8: 1153-1177.
9) Sahu M, Swarnakumar N, Sivakumar K, Thangaradjou T, Kannan L, 2008. Probiotics in aquaculture: importance and future perspectives. Indian J Microbiol, 48: 299–308.
10) Das S, Ward L, Burke C, 2008. Prospects of using marine actinobacteria as probiotics in aquaculture. Appl Microbiol Biotechnol, 81: 419–429.
11) Zhou Q, Li K, Jun X, Bo L (2009), Role and functions of beneficial microorganisms in sustainable aquaculture. Bioresource Technol, 100: 3780–3786.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	20
2	Seminar	20
3	Final exam	60

NHA TRANG UNIVERSITY

1. Course information

Title	Environmental and Natural Resource Economics
Code	ECS520
Credit	2
Prerequisite	No
Semester	2
Instructor	Dr. Ngoc T. Khanh QUACH Dr. Thuy T. Thanh PHAM
Key words	Pollution, environment evaluation, non – renewable resource management, renewable resource management

2. Course description

This course will cover a variety of topics concerning application of welfare economics to environment and natural resource issues. We will examine the problem of market failure, pollution, the economic valuation of environmental amenities, renewable and non-renewable resource management, and the impact of trade.

3. Objectives

The course aims to equip students with the knowledge and economic methods and tools to analyze basic environmental and natural resource issues. This course combines theoretical analysis with discussions on specific policies as applied to air pollution and energy issues, and fisheries and forestry sector

4. Learning outcomes

After completing the course, the student should be able to

1) Understanding basic economic principles governing the allocation of various categories of scarce natural/environmental resources among competing use
2) Gain experience with basic analytical tools useful for applying these principles to real world allocation problems

5. Content

No.	Topic
1	Introduction to environment economics
2	Sustainability and sustainability development
3	Market failure and environment
4	Pollution control: targets
5	Pollution control: instruments
6	Trade and the environment
7	Cost and benefit analysis
8	Environment valuation
9	Efficient and optimal use of non-renewable natural resources
10	Efficient and optimal use of renewable natural resources

6. Teaching method

Homework needs searching and summarizing journal papers and preparing for reporting on all items of 10 lectures. Active participation in lectures and seminars

7. References

1) Perman, R., Y. Ma, J. McGilvray og M. Common (2003), 3. Ed.; *Natural Resource and Environmental Economics*.
2) Conrad, J., Resource Economics, Cambridge: Cambridge University Press, (2005);
3) Kolstad, C., Environmental Economics, Oxford: Oxford University Press, (2000).

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	10
2	Seminar	20
3	Final exam	70

NHA TRANG UNIVERSITY

1. Course information

Title	Coastal Zone Economics and Management
Code	FIE510
Credit	2
Prerequisite	No
Semester	2
Instructor	Dr. Ngoc T. Khanh QUACH
	Dr. Thuy T. Thanh PHAM
Key words	Coastal zone management, climate change, renewable resource use

2. Course description

This course focuses on the use and management of the coastal zone (CZ) from an economic perspective. CZs are used for many purposes, such as fisheries, aquaculture, recreation, tourism, industrial development and waste depositing. In most cases such uses have developed both competitively and through cooperation and management. When discussing CZ management from an economic point of view, we build on economic analyses in the fields of microeconomics, fisheries, aquaculture, environment, development and tourism. In addition to economic concepts material, some material from other social sciences and natural sciences will be used

3. Objectives

The purpose of the course is to provide tools for analysing coastal zone development, competitively and cooperatively, when the resources are limited and have competing ends. Further the aim is to nurture the students' capacity for critical thinking about the importance of integrated coastal zone management.

4. Learning outcomes

After completing the course, the student should be able to:
Students can get insight into the theoretical and practical challenges of CZ management

5. Content

No.	Topic
1	Welfare economics
2	Valuing the CZ environment
3	Cost-benefit
4	Integrated coastal zone management (ICZM)
5	Coastal resources and poverty
6	Aquaculture
7	Tourism
8	Recreation
9	Industrial development
10	Waste depositing

6. Teaching method

Homework needs searching and summarizing journal papers and preparing for reporting on all items of 10 lectures. Active participation in lectures and seminars

7. References

1) Kim Anh Thi Nguyen and Ola Flaaten (2011). A Mekong Vietnamese small-scale fishing community, In Svein Jentoft and Arne Eide (Eds.) Poverty Mosaics - Realities and Prospects in Small-Scale Fisheries, pp.335-357. Springer, Berlin.
2) Reithe, S., C. Armstrong and O. Flaaten (2011). The economics of MPAs revisited. Manuscript, September 2011, The Norwegian College of Fisheries Science, University of Tromsø.
3) Béné, C., B. Hersoug & E.H. Allison. 2010. Not by rent alone: Analysing the pro-poor functions of small-scale fisheries in developing countries. Development Policy Review, 28, pp. 325-358.
4) (Flaaten, O. (2010). Fisheries rent creation and distribution – the imaginary case of Codland. Marine Policy 34:1268-1272.)
5) Ngoc, Q.T.K. and O. Flaaten (2010). Protected areas for conflict resolution and management of recreational and commercial fisheries. Marine Resource Economics 25: 409-426.
6) Flaaten, O. and E. Mjølhus (2010). Nature reserves as a bioeconomic management tool – a simplified modeling approach. Environmental and Resource Economics 47:125-148.

7) Khanh Ngoc, T.Q., O. Flaaten and N.T. Kim Anh (2009). Efficiency of fishing vessels affected by a marine protected area – the case of small-scale trawlers and the marine protected area in Nha Trang Bay, Vietnam. In E. Dahl, E. Moksness and J.G. Støttrup (Eds.) Integrated Coastal Zone Management, Wiley-Blackwell, Ch. 15.
8) Erlend Moksness, Jakob Gjøsæter, Guillaume Lagaillarde, Eirik Mikkelsen, Esben Moland Olsen
9) Håkan T. Sandersen, and Jon Helge Vølstad (2011). Effects of Fishing Tourism in a Coastal Municipality: a Case Study from Risør, Norway. Ecology and Society http://dx.doi.org/10.5751/ES-04290-160311
10) E. Dahl, E. Moksness and J.G. Støttrup (Eds.) (2009). Integrated Coastal Zone Management, Wiley-Blackwell.
11) R. Kay and J. Alder, Coastal Planning and Management 2nd Edition (New York: Taylor & Francis, 2005).
12) B. Cicin-Sain and R.W. Knecht, Integrated Coastal and Ocean Management: Concepts and Practices (Washington, D.C.: Island Press, 1998)
13) J.R. Clark, Coastal Zone Management Handbook (Boca Raton: CRC Lewis Publishers, 1996)
14) R. Costanza, R. et al., Principles for Sustainable Governance of the Oceans. Science, 282, 198-199. Download from: http://www.sciencemag.org/content/281/5374/198.full or http://www.sciencemag.org/content/281/5374/198.full.pdf

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	
2	Seminar	
3	Final exam	

NHA TRANG UNIVERSITY

1. Course information

Title	Fisheries Economics and Management
Code	EC511
Credit	2
Prerequisite	Advanced Microeconomics
Semester	Summer session
Instructor	Dr. Long Kim LE Dr. Thuy T.Thanh PHAM PhD. Duy Ngoc NGUYEN
Key words	Bioeconomics, Fisheries Economics

2. Course description

The interplay between vessels/fishermen, economic indicators and fish stocks is studied for the case of an open access fishery and for different management regimes. Bioeconomic theory and the economics of fishing firms are used in the analysis of selected fisheries. Practical issues related to the use of available data for establishing bioeconomic reference points are addressed.

3. Objectives

The aim of this course is to give the student a broad understanding of fisheries from an economic perspective. The student will obtain knowledge of the foundations of bioeconomic models, and will learn to apply them to different fisheries and management options.

4. Learning outcomes

After completing the course, the student should be able to

1) have a good theoretical background in bioeconomic principles which could be used in practical management tasks
2) be able to integrate biological knowledge related to population dynamics with economic reasoning,
3) have knowledge to investigate the interplay between vessels/fishermen and fish stocks in open access fisherie and under varying management,
4) regimes and competence to present how bioeconomic theory is used in the analysis of selected fisheries,
5) address practical issues related to the use of available data for establishing bioeconomic reference points

5. Content

No.	Topic
1	Population dynamics and fishing
2	Basic bioeconomic model
3	Investment analysis
4	The Gordon-Schaefer model
5	Fishing vessel economics

6. Teaching method

Lectures and seminars

7. References

1) Flaaten, O. 2011. Fisheries economics and management. Tromsø, Norway: University of Tromsø. https://docs.google.com/viewer?url=http://www.ub.uit.no/munin/bitstream/10037/2509/1/book.pdf
2) Clark, C. 1990. Mathematical bioeconomics: the optimal management of renewable resources. 2nd ed. New York: Wiley.
3) Gordon, H. S. 1954. The economic theory of a common property resource: the fishery. Journal of Political Economy, 62, pp. 124-142.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	30
2	Seminar	20
3	Final exam	50

NHA TRANG UNIVERSITY

1. Course information

Title	Marine Resource Economics and Management
Code	FIE502
Credit	2
Prerequisite	No
Semester	Summer
Instructor	Dr. Long Kim LE Dr. Thuy T.Thanh PHAM PhD. Duy Ngoc NGUYEN
Key words	Fisheries economics, marine resource management, conservation, biodiversity

2. Course description

The course provides knowledge of the foundations on marine science and marine biodiversity, marine resources and the international convention on marine law in 1982, management approachs on coastal and offshore marine resources from economic perspectives, procedures and methods to identify values of marine environment, and marine ecosystem based management.

3. Objectives

The aim of this course is to give the students a broad understanding of marine resources from economic and management perspectives. The students will obtain methods of applying bioeconomic models into management in different cases, tools to identify values of marine environment, and approaches to develop sustainably marine environment and resources.

4. Learning outcomes

After completing the course, the student should be able to:

1) Understand management approaches on marine resources for different cases.
2) Analyze economic values of marine resources and marine ecosystem based management approaches.
3) Analyze policy options on managing marine resources.

5. Content

No.	**Topic**
1	Introduction on marine science and marine biodiversity
2	Ocean economy
3	Coastal resource economics and management
4	Offshore resource economics and management
5	Market unbased environment valuation
6	Marine ecosystem based management and conservation

6. Teaching method

Students are requested to do assignments and take part in the group discussions.

7. References

1) Armstrong, C.W. (2007). A note on the ecological-economic modeling of marine reserves. Ecological Economics 62, 242-250.
2) Beaumont, N.J., M.C. Austen, S.C. Mangi and M. Townsend (2008). Economic valuation for the conservation of marine biodiversity. Marine Pollution Bulletin 56, 386-396.
3) Flaaten, O. (2008), Lecture notes on Fisheries Economics and Management, University of Tromsø. Hannesson, R. 1998. Marine Reserves: What Would They Accomplish? Marine Resource Economics, 13, 159-170.
4) Hannesson, R. (2003): Aquaculture and fisheries. Marine Policy, 27, 169-178 Hartwick and Olewiler (1998). The Economics of Natural Resource Use. Chapter 5.
5) Johnston and Tyrrel (2005). A Dynamic model of sustainable tourism. Journal of Travel Research, 44,124-134.
6) Lipton, Wellman, Sheifer and Weiher (1995). Economic Valuation of Natural Resources: A Guidebook for Coastal Resources Policymakers. Chap. 4 & 5.
7) S. Devarajan and A. C. Fisher, (1981). Hotelling's "Economics of Exhaustible Resources": Fifty Years Later. Journal of Economic Literature, Vol. 19(1):65-73.
8) Lê Kim Long, The Potential for Cooperation in Shared Fisheries – Theory and Application to Vietnam's Fisheries Strategy in the South China Sea. PhD dissertation, Tromsoproduct 40 00

72 00 (ISBN 978-82-91068-70-5), 2009.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	10
2	Seminar	20
3	Final exam	70

NHA TRANG UNIVERSITY

1. Course information

Title	Fisheries Marketing
Code	
Credit	2
Prerequisite	Basic Marketing
Semester	2
Instructor	Dr. Tuu Huy HO
Key words	

2. Course description

This course describes how the concepts and practice of modern marketing management can be applied in the fisheries and aquaculture industry. It explains how an improvement in business management, especially in marketing can increase both sales and profits. The early parts focus on the concept of satisfying customer need and the use of market research to construct marketing system models which can be used to correctly position existing products and formulate plans for new products or strategies. Then it is shown that execution of marketing programmes involves the other variables of price, promotion and distribution. Application and control of these variables is described with examples from various sectors of the industry.

3. Objectives

The objectives of the course is to aim train leaners to understand and to be able to apply the knowledge of fisheries marketing in their future job, especially in fisheries area.

4. Learning outcomes

After completing the course, the student should be able to

1) The leaners can make a research to provide overview of fisheries sectors in a market such as aquaculture, fishing, fish processing and exporting, then can establish major targets for fisheries development in the future and propose fisheries marketing development policy.
2) The learners can describe the role of various operations in fisheries marketing such as fisher folk, fish farmers, wholesalers, retailers, processors, institutional consumers, household consumers, and public sector responsibilities.
3) The learners can analyze the fisheries marketing system in a market including nain fisheries marketing channels, prices, fisheries marketing operations, infrastructure and equipment for fisheries marketing and labour in fish production, processing, and marketing.
4) The learners can analyze fisheries products about the fisheries market aspects such as fisheries marketing channels, market structure, conduct and performance, or analyze fisheries marketing situation, and propose marketing strategies to increase profits by making priorities for improvement actions.

5. Content

No.	Topic
1	Marketing concepts
2	Marketing system and marketing environment
3	Segmentation and product position
4	Marketing-mix strategy
5	Marketing plan
6	Marketing control system

6. Teaching method

Lecture notes and group presentations.

7. References

1) Economics Facuity – NTU, Fisheries marketing, Lecture notes.
2) Lem, A., Tietze, U., Rucket, E., van Anrooy, R. (2004), Fish marketing and credit in Viet Nam, Food and Agriculture organization of the UN.
3) Chaston, I. (1991), Marketing in Fisheries and Aquaculture, 1st Edition, Wiley.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	30
2	Seminar	20
3	Final exam	50

NHA TRANG UNIVERSITY

1. Course information

Title	Marine Nutraceuticals and Functional Foods
Code	FOT517
Credit	2
Prerequisite	Course in general biochemistry or permission of instructor
Semester	2nd semester
Instructor	Dr. Han The NGUYEN
Key words	Nutraceuticals, Functional foods, Marine bioactive compounds, Cosmeceuticals, Pharmaceuticals.

2. Course description

The course will describe the biological activities, health benefits, and potential applications of a variety of marine natural substances.

3. Objectives

The course aims to provide the latest trends and approaches, and future applications of marine nutraceuticals with the emphasis on the medicinal and cosmetic properties.

4. Learning outcomes

After completing the course, the student should be able to

1) Define functional foods and nutraceuticals.
2) Acquire knowledge of the origin, classification and biosynthesits of marine natural compounds.
3) Acquire knowledge of the general principles on how to isolate and characterize bioactive natural products from marine resources.
4) Acquire knowledge of the functions of important bioactive marine natural products and their potential applications in various areas including functional food, pharmaceutical, and cosmeceutical.
5) Explain the mechanism(s) of action, bioaccessibility and bioavailability of marine natural compounds
6) Acquire skills in written and oral communication on the topic of marine nutraceuticals and functional foods

5. Content

No.	Topic
1	Nutraceuticals and functional foods: An overview
2	Marine bioactive peptides and protein hydrolysates: Bioactvities and applications
3	Seaweed carotenoids: Health benefits and applications
4	Polyunsaturated fatty acids: Sources, health effects and applications
5	Marine enzymes: Production and applications
6	Sulfated polysaccharides from marine algae: Biological activities and potential health benefits
7	Marine biotoxins: Potential pharmacological uses
8	Chitin, chitosan and their derivatives from marine by-products: Potential food and pharmaceutical applications

6. Teaching method

Lecture, study group and seminar

7. References

1) Barrow, C., Shahidi, F. (2008). Marine nutraceuticals and functional foods. New York: CRC Press/ Taylor & Francis.
2) Venugopal, V. (2009). Marine products for healthcare: Functional and bioactive nutraceutical compounds from the ocean. Boca Raton: CRC Press/Taylor & Francis.
3) Kim, S.W. (2015). Springer handbook of marine biotechnology. Berlin, Heidelberg, Germany: Springer.

8. Assessment

No.	Type of Evaluation	Percentage (%)
1	Test	20
2	Seminar	40
3	Final exam	40