

Implementation memory of the Master of Aquatic Resource Diversity and Conservation

A. GENERAL AND ORGANIZATIONAL ASPECTS

1. Denomination of the study
Aquatic resource management

2. General organization

Institution or institutions: Can Tho University

Study regime (full time/partial time): Full time

Modality (on-site, on-line, mixt): On-site

Complete time: 2 years

Training period (annual, half-yearly, quarterly): annual

Credits number to be achieved: 60

Language: Vietnamese

Professional prospects (research, professional, mixt): mixt

3. Objectives

The program aims to strengthen students with deep knowledge on aquatic biodiversity, conservation biology, environment impact assessment and ecosystem management and facilitate them to be proactive, creative and able to work and do research independently in conservation of aquatic biodiversity and resources for sustainable management of the ecosystems.

4. Outcomes

- Master highly specialized knowledge on biology conservation
- Master highly specialized knowledge on aquatic ecology and ecosystem management
- Master highly specialized knowledge on aquatic genetic biodiversity
- environment impact assessment and management
- Assess the status of biodiversity and ecosystems
- Apply proficiently tools for assessment of aquatic biodiversity and ecosystem management
- Propose measures for biodiversity conservation and management of aquatic ecosystems
- Develop and manage the research activities related to aquatic biodiversity and ecosystem management

5. Admission

Maximum number of students: 20-30



Admission and selection criteria or merits assessment:

Graduated from fields of Aquatic resource management; Fishing technology; Aquaculture; Fish pathology.

Other fields related to aquatic resource diversity and conservation will be considered based on academic performance of undergraduate level. Prerequisites of biology, chemistry, and calculus at undergraduate level required for students who are applying this master program.

Admission will be implemented through the entrance examination organized in March and August annually.

For foreign students, recruitment will be implemented based on profiles screening with their performance including transcripts, graduation diploma and English proficiency.

Previous studies acknowledgement:

Aquatic resource management, Fishing technology, Aquaculture, Fish pathology, Ecology

B. JUSTIFICATION

1. Comparability of the qualification in the international context

Aquatic resources have been playing an important role in the development of a region, especially livelihood of millions people who are living nearby. In the Mekong region, Mekong river is large and ranked second after Amazon river in terms of species diversity and the resources have been nourished millions of people in the riparian countries. However, many threats have occurred and threaten the resources. Protection and conservation of the resources are of important in maintaining livelihood of people. In order to promote these indispensable activities, building an awareness of people on resource protection is extremely crucial. However, training a human resource who are capable in knowledge and skills to conduct the mandate of protection and conservation of the resources is much more important.

With that objective, the curriculum of Aquatic resource diversity and conservation was established. This curriculum is formulated based on benchmarking with other curriculum from University of Exeter, Victory University of Wellington and Wageningen University (England) and Research (Holland). Many courses are consulted from these programs. In addition, recommendation and suggestions to modify and adjust the curriculum were also given from staff of EU partners (Gent University, University of BOKU, University of Girona and University of Toulouse III Sabatier. Therefore, the curriculum is not only relevant to the conditions of the Mekong Delta and Vietnam but also meet global requirement, especially in the region. The courses are designed to offer international students who are interested in aquatic biodiversity and conservation. In addition, the curriculum is also formulated with purpose to conduct exchange with EU universities, thus it is also in line of international standard.

2. Internal academic referent



a. Relationship with other existent degrees with official character:

At the moment there are two MSc programs are operated at CTU including MSc program in Aquatic resource management and MSc program in Aquaculture. The first one is professionally close to this curriculum as it contains many courses in aquatic resources which can be connected to this curriculum. Practically, some courses of both programs can be taken by both students from separate program. Another MSc program is recently formulated and also recruits students at the same time with this program is Climate change and integrated management of coastal Aquaculture and some course were also designed for both program students. The International master program in Aquaculture has been operated for 2 years and could be linked to this program. This is a collaborative program between Vietnamese universities (Can Tho University, Nha Trang University, Hue University, National University of Agriculture and Research Institute for Aquaculture No2) and Flemish universities (Gent University and KU-Leuven University). Students of these two programs can exchange and communicate to each other to share in resources and aquaculture which is very important in the resource and considered one of the solution to reduce pressures on natural resources even though it also causes certain impacts on the wild in case of increased nutrients from effluents.

A similar program of BSc level has been offered since 2010 and can be a source of recruitment for this program.

In addition, a PhD program of the same field with this MSc program has also been formulated and after completing the master level, graduates can continue take the PhD degree at the same field.

b. Existent offer in CTU of similar programmes:

- BSc. in Aquatic resource management
- BSc. in Natural resource and environment management
- MSc. in Aquatic resource management
- MSc. in Ecology
- MSc. in Natural resource and environment management

c. Research lines that supports the programme:

The research groups of the CONSEA Universities supporting this initiative are:

Research group code	Research group name	Number of members	Number of projects*	Number of agreements*
CTU Aquatic resources	Resources, Biodiversity, Taxonomy	6	7	5
CTU Aquatic environment and ecology	Aquatic Environment Monitoring, Ecology, Aquatic invertebrates	10	8	6
CTU Environment and natural	Environment, Natural resources,	10	8	7



resources	Modelling, Remote sensing			
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3. Society needs (demand)

Under many anthropogenic impacts including overfishing, pollution, habitat alternation, the aquatic resources have been dramatically declined. Management, protection and conservation of the resources are extremely indispensable. Demand of qualified human resources for management and conservation of the resources is therefore at high level.

4. Potential source of students

Candidates could be the ones who graduated from the BSc program of the same field and are working in different organizations including governmental and non-governmental stakeholders. In addition, students from other fields such as Aquaculture, Fishing technology, Ecology are also the potential candidates of the program.

C. ACADEMIC ASPECTS

1. Training goals of the study: competences profile

a. Characteristics and objectives of the degree

The Master program in Aquatic resource diversity and conservation was formulated in the framework of the project “Developing curricula for Environmental safety and Conservation of the Biodiversity in South-East Asia” (CONSEA) with support from University of Toulouse III-Paul Sabatier (France), University of Gent (Belgium), University of Girona (Spain) and University of Natural Resources and Life Sciences (BOKU –Austria). The programme is designed to provide students with an interdisciplinary education emphasizing in aquatic resource biodiversity and conservation. The knowledge of the program covers both biodiversity related to the importance of aquatic species including plants and animals and the way to protect and conserve them. Tools for protection and management of resources will be given to help learners to manipulate in analyzing and assessing the resources as well as biodiversity. In addition, correlation between aquaculture and biodiversity will be also mentioned to understand more on the importance and impacts among two fields which are very crucial to people in the region.

At the moment of completing the program, students will be able to:

- Master firmly specialized knowledge on aquatic biodiversity and conservation
- Master firmly specialized knowledge on aquatic ecology and ecosystem management
- Master highly specialized knowledge on environment impact assessment and management
- Assess the status of biodiversity and ecosystems
- Apply proficiently tools for assessment of aquatic biodiversity and ecosystem management
- Propose measures for biodiversity conservation and management of aquatic ecosystems



- Self-organize research activities related to aquatic biodiversity and ecosystem management

b. Target groups /audience

- Graduate students holding bachelor degree in related fields of study
- Staff from governmental organizations working in the same fields
- Staff from non-organizations who are working on biodiversity and conservation areas
- Others who are interest in the program

c. Output profile of the graduates

After graduation, students are capable to work at different positions such as leader, manager, officer, staff of the conservation, protection of governmental or non-governmental organizations; researcher or lecturer on biodiversity conservation, aquatic resources of national or international institutions. Students can continue to pursue PhD degree at universities offering programs on aquatic biodiversity and conservation.

d. Competences explanation

i. Transversal competences (general)

- Ability to analyse and synthesis
- Ability to analyse and assess
- Ability to analyse and apply
- Ability decide and manage
- Ability to criticize
- Ability to review
- Ability to manage and plan
- Decision making
- Skills to communication and working in group

ii. Specific competences

- Analysing data
- Interpreting data
- Comparing data
- Managing data
- Ability to assess the status of aquatic biodiversity
- Ability to analyse status of resources
- Ability to compare the situation of biodiversity
- Ability to design a protect area
- Ability to apply new technologies on works such as GIS, remote sensing techniques
- Capacity to develop a planning for biodiversity conservation
- Ability to design a master plan of conservation.
- Ability to write a proposal



- Ability to write a scientific report and paper
2. Curricular structure

The curriculum contains 4 blocks of knowledge including Generic knowledge (3 credits), Fundamental knowledge (12 credits), Specialized knowledge (20 credits) and Thesis (25 credits). The generic block contains 3 compulsory credits which are about philosophy. The fundamental knowledge contains 12 credits in which 8 are compulsory and 4 are elective. This module provides knowledge on aquatic ecosystems and conservation biology. In the specialized module there are 10 compulsory credits and 10 elective credits providing knowledge on methodology to assess the resources and tools to manage and conserve aquatic resources. Final module is thesis which is 25 credits. Students will focus on preparing the research proposal, conducting research and defending thesis.

3. Envisage measures for students mobility

CTU has conducted student exchange program for years with many universities in South East Asian countries such as Kasetsart University, King Mongkut University, Ubon Ratchathani University, Maejo University, Rajamangala University of Technology Srivijaya, Asian Institute of Technology (Thailand); University of Malaysia Terengganu, University Malaysia Putra (Malaysia), Airlangga University (Indonesia)... Additionally, other universities in Taiwan (National Taiwan Ocean University), Korea... Under the framework of Erasmus + CONSEA project, students will have more chances to go exchange in other universities during the course of study.

4. Envisage of possible collaborations with other professionals and researches that not will hold the professor status.

D. Courses Description of Master Program in Aquatic resource diversity and conservation

Codes		Credits
Course required by MOET regulation		
ML605	Philosophy	3
i. Core courses		
AQ604	Tropical aquatic ecosystems	2
TSQ626	Conservation Biology	2
TSQ627	Aquatic population genetics and biodiversity	2
ii. Major courses		
TSQ631	Fish stock assessment and fisheries management	2
AQ647	Responsible aquaculture and fisheries	2
TS649	GIS application in aquatic resource management	2



TSQ634	Aquatic resource conservation area establishment	2
TSQ640	Field study and seminar	2
iii. Elective courses		
TSQ628	Aquatic animal biology and eco-toxicology	2
TSQ629	Climate change and ecosystem management	2
TSQ630	Environment ecology	2
TSQ632	Sustainable fisheries management	2
TSQ637	Impact of hydropower dams on aquatic biodiversity	2
TSQ638	Environmental impacts and risks assessment	2
TSQ642	Water quality modelling	2
TS645	Bio-monitoring in aquatic environment	2
TSQ615	Water quality management in aquaculture systems	2
AQ649	Environmental and Resource Economics	2
TS640	Project formulation and appraisal	2
TSQ636	Aquaculture and biodiversity conservation	2
TSQ602	Aquatic resources	2
iv. Research Courses		
TSQ625	Research methodology and applied statistics in aquatic resource management	2
TSQ896	Presentation I (Planning)	2
TSQ897	Presentation II (Intermediate)	2
TSQ898	Presentation III (Conference)	3
TSQ899	Laboratory seminar	3
v. Thesis		
	Thesis Writing	15
Total	i + ii + iii + iv + v (Min. - Max.)	11 + 8 + 14 + 12 + 15

A: Core courses

AQ604 TROPICAL AQUATIC ECOSYSTEMS

Course Description

The course will provide knowledge on biotic and abiotic features of different tropical ecosystems including mangrove, coral reef, river and pond, and wetland ecosystems... Structure and function of the ecosystems will be also discussed in which ecological issues related to biodiversity, habitats and adaptation of aquatic fauna and flora to living conditions in different ecosystems are mentioned. Impacts of human activities and global climate change on the ecosystems and measures for protection and conservation of the ecosystems will be also discussed.

Learning Outcomes:

- Master the knowledge on biotic and abiotic features of a tropical ecosystem
- Understand biological and physical processes in the ecosystems
- Identify roles and importance of different aquatic ecosystem

Competences

- Analyse and evaluate the status of an aquatic ecosystem
- Apply knowledge of biodiversity, adaptation mechanisms of aquatic fauna and flora in the ecosystem to propose measures for protection and management of the ecosystems

Teachers' profile

Vu Ngoc Ut, PhD, Associate Professor

- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: ynut@ctu.edu.vn; Tel: +84 913618858
- Qualification: MSc in Aquaculture from Gent University (1997); PhD in Applied marine biology from University of Wales Bangor, UK (2003).
- Teaching fields: Aquatic ecology, Aquatic invertebrates, Aquatic biodiversity and conservation, Aquatic bio-monitoring
- Research fields: Biodiversity, Water quality, Bio-monitoring, Live food production
- Recent publications:
 - Ut, V.N., Giang, H.T., Phu, T.Q., Morales, J. and Phuong, N.T. (2016). Assessment of water quality in catfish (*Pangasianodon hypophthalmus*) production systems in the Mekong Delta. *Can Tho University Journal of Science*. Vol 3: 71-78.
 - Vu Ngoc Ut, Au Van Hoa & Nguyen Bach Loan (2015). Diversity of fish Hau river, Mekong Delta, Vietnam. *Journal of Fisheries and Technology, Nha Trang University*. Special issue-2015:167-174.
 - Vu Ngoc Ut, Nguyen Ba Quoc & Son Sam Phone (2014). Assessment of water quality in shrimp culture areas in the Mekong Delta. *Journal of Agricultural Science and Technology B*, 4: 571-580.
 - Vu Ngoc Ut and Tran Thi Kieu Trang (2014). Species composition and fishing status of cephalopods resources in Ha Tien sea, Kien Giang province. *Proceedings of National Conference on Marine Biology and Sustainable Development*, p: 329-336. In Vietnamese.
 - Nguyen Thi Kim Lien, Huynh Truong Giang and Vu Ngoc Ut (2014). Zoobenthos composition in Hau River. *Journal of Science, Can Tho University*, 2: 239-247. In Vietnamese.
 - Vu Ngoc Ut & To Cong Tam (2013). Species compositions and fishing status of seahorses (*Hippocampus* spp.) in Phu Quoc Island, Vietnam. *Proceedings of the International Conference on "Bien Dong 2012"*, p. 36-45.



- Nguyen Thi Kim Lien, Huynh Truong Giang and Vu Ngoc Ut (2013). Zooplankton biodiversity in the Cu Lao Dung mangrove, Soc Trang province. Journal of Science, Can Tho University, vol. 25: 149-157. In Vietnamese.
- Nguyen Tho, Roel Mercks and Vu Ngoc Ut (2013). Impacts of saline water irrigation and shrimp pond discharges on the surrounding waters of a coastal district in the Mekong delta of Vietnam. Environmental Earth Sciences. DOI:10.1007/s12665-013-2603-9.
- Au Van Hoa, Nguyen van Thuong and Vu Ngoc Ut (2013). Species composition and production of Palaemonid and Penaeid shirmp in Hau River. Proceeding of National Scientific Conference for youth on fisheries, pp. 566-574. In Vietnamese.

Languages: Vietnamese

TSQ626 CONSERVATION BIOLOGY

Course Description

The course will introduce basic concepts of biodiversity and management on knowing where biological diversity is found; discussing on values of biological diversity; Assessing biological diversity; identifying vulnerability of biological diversity; Evaluating effects of habitat fragmentation and discussing design of conservation reserves. In addition, the course will also cover conservation priorities and activities in the Mekong region to provide hand-on experience in biodiversity management by means of field projects carried out by course participants; to introduce education and training methodology for the design and implementation of biodiversity academic courses and special training for communities in biology/conservation-related subjects. In addition, a modelling tool such as BIOCLIM will be used as a technique for management and conservation of biodiversity.

Learning Outcomes:

- Understand basic concepts of biodiversity and have knowledge of techniques commonly used in biodiversity conservation;
- Have knowledge of major biology ecosystems of the Mekong region;
- Understand major issues related to biodiversity conservation in the lower Mekong basin;
- Be familiar with commonly-used methods/equipment relevant to biodiversity survey and scientific research;

Competences

- Analyse and evaluate biodiversity
- Design and conduct a biodiversity study project;
- Understand the method and have necessary materials to develop and teach biodiversity conservation courses at college level and to develop and implement education activities, special training for communities



- Utilize proficiently the modelling tool for management and conservation of the biodiversity

Teachers' profile

Duong Van Ni, PhD

- Working institution: College of Environment and Natural Resources, Can Tho University (Vietnam)
- Contacts: dvni@ctu.edu.vn; Tel: +84 909987887
- Qualification: PhD in Geography (Royal Holloway Institute, University of London, U.K., 2001).
- Teaching fields: biodiversity conservation, ecosystem management, socio-economic, environment management.
- Research fields: wetland biogeochemistry, wetland ecology/functional assessment, socio-economic assessment, decision support system, integrated intensive agriculture and conservation; seasonally inundated grassland, peat swamp forests, mangroves habitats.
- Recent publications:
 - Ni, D. V., R.J. Safford, E. Malby and N. P. Branch: Chapter 37, Melaleuca wetland and sustainable development in the Mekong delta, Vietnam. In: The Wetlands Handbook, 1st edition. Edited by E. Maltby and T. Barker. 2009 Blackwell publishing, ISBN 978-0-632-05255-4
 - Ni, D. V., Tran, T., Barzen, J., Choowaew, S., Engels, M., Nguyen, A.M., Inkhavilay, K., Kim, S., Rath, S., Gomotean, B., Le, X.T, Aung, K., Nguyen, H.D., Nordheim, R., Lam, H.S.T., Moore, D.M., and Wilson, S., 2014, Persistent organic pollutants in wetlands of the Mekong Basin: U.S. Geological Survey Scientific Investigations Report 2013 – 5196, 140 p., <http://dx.doi.org/10.3133/sir20135196>. ISSN 2328-0328 (online)
 - Ni, D. V. and Le Anh Tuan, 2015. Review existing water management strategy in Tram Chim National park and develop the new strategy that climate change issues are incorporate. WWF – Vietnam, Project No. VN202500 – VZ2100 and VZ4100, Final Report, 45 pages.

Languages: Vietnamese

TSQ627 AQUATIC POPULATION GENETICS AND BIODIVERSITY

Course Description:

The course introduces theory of population genetics and the applications in biodiversity conservation. The course will cover following main topics: (i) Genetic variation of natural aquatic populations; (ii) Mechanisms of evolutionary changes; and (iii) applications of population genetics in biodiversity conservation.

Learning Outcomes:

- Reinforce basic knowledge on fish population genetics
- Understand mechanisms of evolutionary changes in natural aquatic populations.
- Acquire different genetic tools in address questions in biodiversity and conservation of aquatic populations.

Competences:

- Perform laboratory skills on molecular analyses
- Use some basic statistical genetic programs for genetic data analyses.

Teachers' profile:

Duong Thuy Yen, PhD, Associate Professor

- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: thuuyen@ctu.edu.vn; Tel: +84 907526845
- Qualification: PhD in Fisheries and Wildlife, Ecology, Evolutionary Biology and Behavior
- Teaching fields: Genetics
- Research fields: Genetic population of fish, DNA barcoding
- Recent publications:
 - Duong TY, Scribner KT, Kanefsky J, Na-Nakorn U., 2017. Lack of introgressive hybridization by North African catfish (*Clarias gariepinus*) in native Vietnamese bighead catfish (*Clarias macrocephalus*) populations as revealed by novel nuclear and mitochondrial markers. *Aquaculture*, 473: 468–477.
 - Duong TY, Nguyen TT, Pham TL., 2017. Morphological differentiation among cultured and wild *Clarias macrocephalus*, *C. macrocephalus* x *C. gariepinus* hybrids, and their parental species in the Mekong delta, Viet Nam. *International Journal of Fisheries and Aquatic Studies*, 5: 233–240.
 - Ayesha I, Duong TY, Siti AMN, Darlina MN., 2016. Molecular identification of commercially important species of *Nemipterus* (Perciformes: Nemipteridae) in surrounding seas of Malaysia. *Biodiversitas*, 17 (2): 571-577
 - Nguyen TNT and Duong TY., 2016. Morphological and genetic differences between cultured and wild populations of *Channa striata* in Viet Nam and its phylogenetic relationship with other *Channa* species. *Songklanakarin Journal of Science and Technology*, Thailand 38 (4) 427-434
 - Duong TY., 2015. Differentiation of two *Clarias* species (*Clarias macrocephalus* and *C. gariepinus*) and their hybrids based on PCR-RFLP analysis. *Journal of Science and Development*, Vietnam, 6: 904-912
 - Duong TY, Liem PT, Ky H., Hai TN., 2013. Strain evaluation of giant freshwater prawn (*Macrobrachium rosenbergii*) based on morphology and genetic diversity. *The proceedings of the International Fisheries Symposium*, Vietnam, 6-8th December, 2012, 239-244.
 - Duong TY, Scribner KT, Forsythe PS, Crossman JA, Baker EA., 2013. Interannual variation in effective number of breeders and estimation of effective population size in long-lived iteroparous lake sturgeon (*Acipenser fulvescens*). *Molecular Ecology* 22: 1282-94



- Duong TY, Scribner KT, Crossman J, Forsythe P, Baker E, Kanefsky J, Homola J, Davis C., 2011. Relative larval loss among females during dispersal of Lake Sturgeon (*Acipenser fulvescens*). *Environmental Biology of Fishes* 91: 459–69

Languages: Vietnamese

B: Major courses

TSQ631 FISH STOCK ASSESSMENT AND FISHERIES MANAGEMENT

Course Description:

Fisheries resources are ecologically, socially and economically important. However, they have been facing numerous threats due to overfishing, habitat degradation, introduced alien species, etc. causing the depletion. Therefore, urgent actions are necessary for sustainable use, management and conservation. The course aims to help students gain key competencies including basic knowledge of social, ecological and economical aspects fisheries management, some key principles in fisheries management and useful tools for stock assessment; skills in gathering data (questionnaire design, interview, sampling) and analysis (stock assessment software); motivation the awareness of sustainable use of fisheries resources through case studies. Students will be experienced the application of key concepts, approaches and software running in case studies chosen by themselves.

Learning Outcomes:

- Understand key concepts in the area of stock assessment, fisheries ecology, economics and management.
- Aware of the importance of fisheries, their status and challenges facing.
- Master firmly the key principles in fisheries management.
- Master firmly the primary stock assessment methods and related software.

Competences:

- Gather and analyse data using professional software.
- Assess and manage fish stocks.

Teachers' profile:

Tran Xuan Loi, PhD candidate

- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: txloi@ctu.edu.vn;
- Qualification: MSc in Marine conservation from University of Tasmania, Australia; PhD candidate in Bioresources restoration sciences, Nagasaki University, Japan.
- Teaching fields: Fisheries stock assessment, Fisheries resources management
- Research fields: Fisheries resources, Fish biodiversity, Fisheries stock assessment,



- Recent publications:
 - Tran Xuan Loi and Andrew Fischer 2017. Spatiotemporal changes and fragmentation of mangroves and its effects on fish diversity in Ca Mau Province (Vietnam). *Journal of Coastal Conservation*, DOI 10.1007/s11852-017-0513-9.
 - Tran Xuan Loi and Dinh Dac Tran, 2015. Impacts of shrimp farming on spatiotemporal changes and fragmentation of mangroves in thanh phu district, Ben Tre Province, Vietnam. *The International Fisheries Symposium 2015 (IFS 2015)*, 2015 Penang, Malaysia.
 - Tran Dac Dinh, Tran Xuan Loi, To Thi My Hoang, Nguyen Thi Vang, Kenzo Utsugi, Tomoko Oizumi, 2015. Roles of estuarine ecosystem in nursing ground: case study in cu lao dung, soc trang province, Vietnam. *The International Fisheries Symposium 2015 (IFS 2015)*, 2015 Penang, Malaysia.
 - Ngwenya Elkana, Phuc Le, and Tran Xuan Loi, 2013. A global study of gender differences in individual perspectives on loss of plant or animal biodiversity: Results from the world value surveys. *Eleventh International Conference on New Directions in the Himanities*, June 2013 Faculty of the Himanities, EÖtvÖs Loránd University, Budapest, Hungary.
 - Tran Dac Dinh, Koichi Shibukawa, Nguyen Thanh Phuong, Ha Phuoc Hung, Tran Xuan Loi, Mai Van Hieu, Utsugi Kenzo, 2013. *Fishes of The Mekong Delta, Vietnam*. Can Tho University Publishing House, Can Tho, 174 pages.

Languages: Vietnamese

AQ647 RESPONSIBLE AQUACULTURE AND FISHERIES

Course Description:

This course aims to provide students knowledge and information on responsibility in farming and fishing including environmental friendly aquaculture systems/models and capturing approaches to sustain biodiversity as well as environments, management policies and strategies to reduce impacts on biodiversity and environment.

Learning Outcomes:

- Understand deeply concepts of responsible aquaculture and fisheries
- Master broadly principles of environmental friendly aquaculture systems and fisheries approaches
- Apply environmental friendly aquaculture systems in practice to protect and conserve biodiversity
- Implement sustainable capture models to protect and conserve biodiversity

Competences:



- Apply and manage responsible aquaculture and fisheries in the lower mekong region
- Disseminate and train people on the responsible aquaculture and fisheries

Teachers' profile:

- **Tran Ngoc Hai, PhD, Professor**
- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: tnhai@ctu.edu.vn
- Qualification: PhD in Aquaculture and Aquatic Resources Management from Asian Institute of Technology, Thailand
- Teaching fields: marine aquaculture, crustacean culture
- Research fields: aquaculture technology, aquaculture farming, seed production
- Recent publications:
 - Hai T. N., C T Tao, N T Phuong (2017). Seed production and farming of crustacean. Can Tho University Publishing House, 212 pp.
 - Hai T. N., L Q Viet, L V Khanh, N T Phuong (2017). Seed production and farming of marine fish. Can Tho University Publishing House, 139 pp.
 - Hai T. N., L Q Viet, L V Khanh, N T Phuong (2017). Principle and technology of mud crab culture. Agricultural Publishing House. 138pp
 - Hai, T.N, T.H. Minh, T.Q. Phu, N.T. Phuong, 2016. Shrimp Industry in Vietnam – Chapter 8 – In I Chiu Liao, Nai-Hsien Chao and Leano (Editors) Progress of shrimp and Prawn Aquaculture in the World. National Taiwan Ocean University, Keelung, Taiwan, The Fisheries Society of Taiwan, Keelung, Taiwan, Asian Fisheries Society, Manila, Philippines, and World Aquaculture Society, Louisiana, USA. p 181-204
 - **Trần Ngọc Hải**, Lê Quốc Việt, 2016. Application biofloc technology at different stocking densities in nursing black tiger shrimp (*Penaeus monodon*). Journal of Science, Can Tho University 47(2016): 96-101
 - **Tran Ngoc Hai**, Pham Minh Duc, Vo Nam Son, Truong Hoang Minh, Nguyen Thanh Phuong, 2015. Innovation in shrimp seed production and farming in Vietnam. World Aquaculture, 46(1): 32-37
 - Roel H. B., Tin H. N. Audrie J. S., Ha T. P. T., and **Hai N. T.**, 2014. Shrimp-based livelihoods in mangrove silvo-aquaculture farming systems, 2014. Reviews in Aquaculture, No. 6(2014) Pp: 1-18.
 - Phuong, N.T., T. N. Hai, T.T.T Hien, Marcy Wilder, 2013. Principle and technology of seed production of giant fresh water prawn. Agricultural Publishing House.
 - Phuong, N.T, N.A. Tuan, T. N. Hai, V.N. Son, D.N. Long, 2014. Aquaculture production. Agricultural Publishing House, 188pp



- **Tran Ngoc Hai**, Le Quoc Viet, Tran Nguyen Duy Khoa, Nguyen Thanh Trung, Ly Van Khanh, Nguyen Anh Tuan, 2013. Advances in seed production of cobia (*Rachycentron canadum*) in the Mekong Delta of Vietnam. In Proceeding of the IFS2012 held at Can Tho City, Vietnam on 06-08 December 2012. Agriculture Publishing House. Pp84-90.
- **Tran Ngoc Hai**, Le Quoc Viet, Ly Van Khanh, Nguyen Thanh Phuong, Nguyen Anh Tuan, 2013. Studies on seed production of indigeneous brackish and marine fish in the Mekong Delta. Science and Technology Journal of Agriculture and Rural Development. MARD, Vietnam. No. 12/2013, 143-148.

- **Nguyen Thanh Phuong, PhD, Professor**

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- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: ntphuong@ctu.edu.vn
- Qualification: MSc. in Aquaculture at Asian Institute of Technology and PhD in Agricultural Sciences (specialized in Aquaculture) from Institut Nationale Polytechnique de Toulouse, France.
- Teaching fields: Principles in Aquaculture, Scientific research methodology, Marine aquaculture
- Research fields: Marine species farming, aquaculture and fisheries under climate changes, fish nutrition, fish physiology, bio-active plan products for aquaculture....
- Recent publications:
 - Le Thi Hong Gam, Frank Bo Jensen, Christian Damsgaar, Do Thi Thanh Huong, **Nguyen Thanh Phuong**, Mark Bayley (2017). Extreme nitrite tolerance in the clown knifefish *Chitala ornata* is linked to up-regulation of methaemoglobin reductase activity. *Aquatic Toxicology* 187 (2017) 9–17.
 - Matthew D Regan, Andy J Turko, Joseph Heras, Mads Kuhlmann Andersen, Sjannie Lefevre, Tobias Wang, Mark Bayley, Colin J Brauner, Thi Thanh Huong, **Nguyen Thanh Phuong**, E Nilsson (2016). Ambient CO₂, fish behaviour and altered GABAergic neurotransmission: exploring the mechanism of CO₂-altered behaviour by taking a hypercapnia dweller down to low CO₂ levels. *Journal of Experimental Biology* 01/2016; 219(1). DOI:10.1242/jeb.131375
 - Nguyen Thi Ngoc Hon, Tran Thi Tuyet Hoa, Nguyen Quoc Thinh, Atsushi Hinenoya, Tatsuya Nakayama, Kazuo Harada, Megumi Asayama, Minae Warisaya, Kazumasa Hirata, **Nguyen Thanh Phuong**, Yoshimasa Yamamoto (2016). Spread of Antibiotic and Antimicrobial Susceptibility of ESBL-Producing *Escherichia coli* Isolated from Wild and Cultured Fish in the Mekong Delta, Vietnam. *Fish Pathology* 01/2016; 51 (Special-issue). DOI:10.3147/jsfp.51.S75
 - Yuichi Kano, David Dudgeon, So Nam, Hiromitsu Samejima, Katsutoshi Watanabe, Chaiwut Grudpan, Jarungjit Grudpan, Wichan Magtoon,



- Prachya Musikasinthorn, **Phuong Thanh Nguyen**, Bounthob Praxaysonbath, Tomoyuki Sato, Koichi Shibukawa, Yukihiko Shimatani, Apinun Suvarnaraksha, Wataru Tanaka, Phanara Thach, Dac Dinh Tran, Tomomi Yamashita, Kenzo Utsugi (2016). Impacts of Dams and Global Warming on Fish Biodiversity in the Indo-Burma Hotspot. PLoS ONE 08/2016; 11(8). DOI:10.1371/journal.pone.0160151
- Le Quoc Viet, Tran Ngoc Hai, **Nguyen Thanh Phuong** (2015). Technical aspects and economic benefits of the juvenile crab nursery in lining tank in Nam Can district, Ca Mau province. Journal of Marine Science and Technology. 09/2015; 15(3). DOI:10.15625/1859-3097/15/3/5780
 - Margot Andrieu, Andreu Rico, Tran Minh Phu, Do Thi Thanh Huong, **Nguyen Thanh Phuong**, Paul J Van den Brink (2015). Ecological risk assessment of the antibiotic enrofloxacin applied to Pangasius catfish farms in the Mekong Delta, Vietnam. Chemosphere. Volume: 119; Pages: 407-414.
 - Pham Minh Duc, Tran Thi Tuyet Hoa, **Nguyen Thanh Phuong**, R.H. Bosma, Huynh Van Hien, Tran Ngoc Tuan (2015). Virus diseases risk-factors associated with shrimp farming practices in rice-shrimp and intensive culture systems in Mekong Delta Viet Nam. International Journal of Scientific and Research Publications. Volume 5, Issue 8.
 - Rasmus Ern, Do Thi Thanh Huong, **Nguyen Thanh Phuong**, Peter Teglberg Madsen, Tobias Wang, Mark Bayley (2015). Some like it hot: Thermal tolerance and oxygen supply capacity in two eurythermal crustaceans. Scientific Reports 06/2015; 5. DOI:10.1038/srep10743.
 - Tran Minh Phu, Caroline Douny, Marie-Louise Scippo, Edwin De Pauw, Nguyen Quoc Thinh, Do Thi Thanh Huong, Huynh Phuoc Vinh, **Nguyen Thanh Phuong**, Anders Dalsgaard (2015). Elimination of enrofloxacin in striped catfish (*Pangasianodon hypophthalmus*) following on-farm treatment. Aquaculture 438 (2015) 1–5
 - Tran Minh Phu, Marie-Louise Scippo, **Nguyen Thanh Phuong**, Cao Thi Kieu Tien, Co Hong Son, Anders Dalsgaard (2015). Withdrawal time for sulfamethoxazole and trimethoprim following treatment of striped catfish (*Pangasianodon hypophthalmus*) and hybrid red tilapia (*Oreochromis mossambicus* × *Oreochromis niloticus*). Aquaculture. Volume 437, Pages 256–262.
 - Tran Ngoc Hai, Pham Minh Duc, Vo Nam Son, Truong Hoang Minh, **Nguyen Thanh Phuong** (2015). Innovation of marine shrimp seed production and farming in Vietnam. World Aquaculture 03/2015;
 - Bui Thi Bich Hang, **Nguyen Phuong Thanh** & Patrick Kestemont (2014). Oral administration of *Escherichia coli* lipopolysaccharide enhances the immune system of striped catfish, *Pangasianodon hypophthalmus* (Sauvage). Aquaculture Research. Pages: 1–10. doi:10.1111/are.12589.
 - Bui Thi Bich Hang, **Nguyen Thanh Phuong** and Patrick Kestemont (2014). Can immunostimulants efficiently replace antibiotic in striped catfish (*Pangasianodon hypophthalmus*) against bacterial infection by *Edwardsiella ictaluri*?. Fish & Shellfish Immunology 40: 556-562.



- Dang Thi Hoang Oanh, Tran Viet Tien and **Nguyen Thanh Phuong** (2014). Effect of Insecticide Containing Deltamethrin on Immune Response of the Giant Freshwater Prawn, *Macrobrachium rosenbergii* (De Man 1879). Asian Fisheries Science 27: 90-103
- Lefevre, S., T. Wang, A. Jensen, N.V. Cong, D.T.T. Huong, **N.T. Phuong**, M. Bayley (2014). Air-breathing fishes in aquaculture. What can we learn from physiology?. Journal of fish Biology. Volume: 84, No. 3. Pages: 705-731.
- Rasmus Ern, Do Thi Thanh Huong, **Nguyen Thanh Phuong**, Tobias Wang, Mark Bayley (2014). Oxygen delivery does not limit thermal tolerance in a tropical eurythermal crustacean. The Journal of Experimental Biology. 217: 1-6. doi:10.1242/jeb.094169
- Bui Thi Bich Hang, Sylvain Milla, Virginie Gillardin, **Nguyen Thanh Phuong** and Patrick Kestemont (2013). In vivo effects of Escherichia coli lipopolysaccharide on regulation of immune response and protein expression in striped catfish (*Pangasianodon hypophthalmus*). Fish & Shellfish Immunology 34 (2013) 339-347.
- **Nguyen, P.T.** & Tran, T.C.L. (2013). Species profile: striped catfish (*Pangasianodon hypophthalmus* Sauvage, 1878). In: Aquaculture Feed and Fertilizer Resources Information System (www.fao.org/fishery/affris/en/org/fishery/affris/en/). Rome, FAO.
- Sjannie Lefevre, Tobias Wang, Do Thi Thanh Huong, **Nguyen Thanh Phuong** and Mark Bayley (2013). Partitioning of oxygen uptake and cost of surfacing during swimming in the air-breathing catfish *Pangasianodon hypophthalmus*. J Comp Physiol B (2013) 183:215–221.
- Tam M. Bui, **Nguyen Thanh Phuong**, Gia Hien Nguyen, Sena S. De Silva (2013). Fry and fingerling transportation in the striped catfish, *Pangasianodon hypophthalmus*, farming sector, Mekong Delta, Vietnam: A pivotal link in the production chain. Aquaculture 388–391 (2013) 70–75.

AQ649 GIS APPLICATION IN AQUATIC RESOURCE MANAGEMENT

Course Description:

This course will provide the students with knowledge and skills on applying GIS and remote sensing (RS) on aquatic biodiversity conservation and ecosystem management. The course will focus on: (i) observation and mapping, (ii) spatial data analysis, and (iii) communication and visualization of spatial information for aquatic biodiversity conservation and ecosystem management. Open and free GIS software will be introduced for implementing a case studies.

Learning Outcomes:

- Understand and design of monitoring and mapping on biodiversity conservation and ecosystem management
- Translate a spatial algorithm into a method using spatial data analysis tools
- Effectively communicate complex spatial information to the users



Competences:

- Utilize proficiently GIS and RS technique
- Read and interpret data
- Establish a map of any parameter

Teachers' profile:

Nguyen Hieu Trung, Associate Professor, Ph.D.

- Working institution: College of Environment and Natural Resources, Can Tho University (Vietnam)
- Contacts: nhtrung@ctu.edu.vn
- Qualification: PhD. in Production Ecology and Resource Conservation
- Teaching fields: GIS technique, remote sensing, water modelling
- Research fields: hydrology, climate change adaptation and mitigation, mapping and modelling
- Recent publications:
 - Tam Van Nguyen, **Nguyen Hieu Trung**, Frank De Troyer: Managing Pile Foundation and Land Cost for High Rise Buildings in the Early Design Stages. *Architectural Engineering and Design Management* 01/2016; 12(3). DOI:10.1080/17452007.2016.1140016
 - **Nguyễn Hiếu Trung**, Phạm Thanh Vũ, Lê Quang Trí, Vương Tuấn Huy, Phan Hoàng Vũ, 2016. *Sustainable Use of Land and Water Resources in the Mekong Delta under Climate Change*. Nhà Xuất bản Nông nghiệp., ISBN: 978-604-60-2152-0
 - Danet Hak, Kazuo Nadaoka, Lawrence Patrick Bernado, Vo Le Phu, Nguyen Hong Quan, To Quang Toan, **Nguyen Hieu Trung**, Duong Van Ni, Van Pham Dang Tri. 2016. *Spatio-temporal variations of sea level around the Mekong Delta: their causes and consequences on the coastal environment*. *Hydrological Research Letters* 01/2016; 10(2). DOI:10.3178/hrl.10.60
 - **Nguyen Hieu Trung**, Chu Thai Hoanh, To Phuc Tuong, Nguyen Xuan Hien, Le Quang Tri, Vo Quang Minh, Dang Kieu Nhan, Pham Thanh Vu, Van Pham Dang Tri: *Climate Change Affecting Land Use in the Mekong Delta: Adaptation of Rice-based Cropping Systems (CLUES) Theme 5: Integrated adaptation assessment of Bac Lieu Province and development of adaptation master plan*. Report number: SMCN/2009/021 Affiliation: ACIAR
 - Dung Phung, Cunrui Huang, Shannon Rutherford, Febi Dwirahmadi, Cordia Chu, Xiaoming Wang, Minh Nguyen, Nga Huy Nguyen, Cuong Manh Do, **Nguyen Hieu Trung**, Tuan Anh Diep Dinh: *Temporal and spatial assessment of river surface water quality using multivariate statistical techniques: a study in Can Tho City, a Mekong Delta area, Vietnam*. *Environmental Monitoring and Assessment* 05/2015; 187(5):4474. DOI:10.1007/s10661-015-4474-x



- Dung Phung, Shannon Rutherford, Cordia Chu, Xiaoming Wang, Minh Nguyen, Nga Huy Nguyen, Cuong Manh do, **Nguyen Hieu Trung**, Cunrui Huang. 2015. *Temperature as a risk factor for hospitalizations among young children in the Mekong Delta area, Vietnam*. Occupational and environmental medicine 03/2015; DOI:10.1136/oemed-2014-102629
- Alex Smajgl, To Quang Toan, Dang Kieu Nhan, John Ward, **Nguyen Hieu Trung**, Le Quang Tri, Van Pham Dang Tri, Pham Thanh Vu. 2015. *Responding to rising sea levels in the Mekong Delta*. **Nature Climate Change** 01/2015; 5. DOI:10.1038/nclimate2469
- Quang Chi Truong, Patrick Taillandier, Benoit Gaudou, Minh Quang Vo, **Nguyen Hieu Trung**, Alexis Drogoul, 2015. *Exploring Agent Architectures for Farmer Behavior in Land-Use Change. A Case Study in Coastal Area of the Vietnamese Mekong Delta*. Multi-Agent-Based Simulation (MABS) workshop 5/2015; 05/2015
- **Nguyen Hieu Trung**, Dinh Diep Anh Tuan, Nguyen Xuan Hoang, Le Quang Tri, Minh N Nguyen. 2014. *Rainwater Harvesting Guidebook for the Mekong Delta (in Vietnamese) - Hướng dẫn Kỹ thuật thu gom và sử dụng nước mưa ở vùng Đồng bằng Sông Cửu Long*. 10/2014; Agriculture Publishing House, Vietnam.
- Neumann, Luis E; Moglia, Magnus; Cook, Stephen; Nguyen, Minh N; Sharma, Ashok K; Nguyen, **Trung Hieu Trung**; Nguyen, Be V, 2014. *Water use, sanitation and health in a fragmented urban water system: case study and household survey*. Urban Water Journal. Volume 11, number 3, pages: 198-210. Taylor & Francis

Languages: Vietnamese

TSQ634 AQUATIC RESOURCE CONSERVATION AREA ESTABLISHMENT

Course Description:

The course provide knowledge on importance, values of aquatic biodiversity, difference between aquatic ecosystems and terrestrial ecosystems in conservation, anthropogenic impacts and threats to aquatic biodiversity and ecosystems, measures for protection, conservation of biodiversity and ecosystem are also discussed, especially methods and steps to establish a protected area.

Learning Outcomes:

- Master firmly the importance of aquatic biodiversity in aquatic ecosystems
- Understand the difference in conservation between terrestrial and aquatic ecosystems for taking proper steps in conservation
- Aware of impacts of anthropogenic activities on aquatic biodiversity
- Ability to assess biodiversity status
- Ability to establish a protected area



Competences:

- Assess an ecosystem status
- Propose measures for protection and conservation of an ecosystem
- Establish and manage a protected area

Teachers' profile:

Vu Ngoc Ut, PhD, Associate Professor (see above)

Tran Dac Dinh, PhD, Associate Professor

- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: tddinh@ctu.edu.vn
- Qualification: PhD in Fish Population Dynamics at University Malaysia Terengganu
- Teaching fields: Fishing Technology and Fish Stock Assessment and Management
- Research fields: Fishing Technology and Fish Stock Assessment and Management
- Recent publications:
 - Quang Minh Dinh, Y Nhu Phan and **Dinh Dac Tran** (2017) Population biology of the goby *Glossogobius giuris* (Hamilton, 1822) caught in the Mekong Delta, Vietnam. *Asian Fisheries Sciences*, 30 (2017): 26-37.
 - Le Nguyen Ngoc Thao, **Tran Dac Dinh** and Duong Thuy Yen (2017) Exploitation status of bighead catfish (*Clarias macrocephalus*) in the Mekong Delta. *Scientific Journal of Can Tho University*, 48b: 18-26.
 - Huynh Van Hien, **Tran Dac Dinh**, Nguyen Duy Can and Dang Thi Phuong (2017) Analysis of livelihood of Gillnet households fishing coastal areas (<90CV) in Phu Quoc District, Kien Giang Province. *Journal of Economics and Management Science*, 2: 81-90.
 - Yuichi Kano, David Dudgeon, So Nam, Hiromitsu Samejima, Katsutoshi Watanabe, Chaiwut Grudpan, Jarungjit Grudpan, Wichan Magtoon, Prachya Musikasinthorn, Phuong Thanh Nguyen, Bounthob Praxaysonbath, Tomoyuki Sato, Koichi Shibukawa, Yukihiro Shimatani, Apinun Suvarnaraksha, Wataru Tanaka, Phanara Thach, **Dac Dinh Tran**, Tomomi Yamashita, Kenzo Utsugi (2016) Impacts of Dams and Global Warming on Fish Biodiversity in the Indo-Burma Hotspot. *PLoS ONE* 11(8): e0160151. doi:10.1371/journal.pone.0160151.
 - Duong Thuy Yen, Nguyen Kiet, Bui Son Nen, Nguyen Van Thuong, Nguyen Bach Loan and **Tran Dac Dinh** (2016) DNA barcodes and morphology of *P. krempfi*, *P. mekongensis*, and *P. elongatus*. *Journal of Biotechnology*, 14(1): 29-37 pp.
 - Dinh, Quang M., Jian G. Qin, and **Dac D. Tran** (2015) Population and Age Structure of the Goby *Parapocryptes serperaster* (Richardson,



- 1864; Gobiidae: Oxudercinae) in the Mekong Delta. Turkish Journal of Fisheries and Aquatic Sciences, 15: 345-357.
- Diep Anh Tuan, Dinh Minh Quang and **Tran Dac Dinh** (2014) Species composition of Gobiidae distributed in the coastal areas, Soc Trang Province. Journal of Science, Ha Noi National University, 30(3):68-76.
 - Quang Minh Dinh, Jian Guang Qin, Sabine Dittmann, and **Dinh Dac Tran** (2014) Burrow morphology and utilization of the goby (*Parapocryptes serperaster*) in the Mekong Delta, Vietnam. Ichthyological Research, 61: 332-340.
 - Nguyen Minh Tuan and **Tran Dac Dinh** (2014) Species composition of Gobiidae, Eleotridae and some biological aspects of *Glossogobius aureus* Akihito & Meguro, 1975 distributed in the coastal areas of Bentre province, Mekong Delta, Vietnam. Paper presented in the 4th International Fisheries Symposium, 30–31th October 2014, Surabaya, Indonesia.
 - Tran, D.D., K. Shibukawa, P.T. Nguyen, H.P. Ha, L.X., Tran, H.V, Mai and K. Utsugi (2013) Fishes of the Mekong Delta, Vietnam. Can Tho University Publishing House, 174 pages.
 - Yuichi Kano, Mohad Shalahuddin Adnan, Chaiwut Grudpan, Jarungjit Grudpan, Wichan Magtoon, Prachya Musikasinthorn, Yoshihiro Natori, Stefan Ottomanski, Bounthob Praxaysonbath, Koneouma Phongsa, Achariya Rangsiruji, Koichi Shibukawa, Yukihiro Shimatani, Nam So, Apinun Suvarnaraksha, Phanara Thach, Phuong Nguyen Thanh, **Dac Dinh Tran**, Kenzo Utsugi and Tomomi Yamashita (2013) An online database on freshwater fish diversity and distribution in Mainland Southeast Asia. Ichthyological Research, Springer, DOI 10.1007/s10228-013-0349-8.
 - Nguyen Minh Tuan, **Tran Dac Dinh**, Nguyen Hoai Anh, Tran Trung Kien and Vo Hoang Lam Truc (2013) The species composition of goby (Gobiidae and Eleotridae) and some feeding, reproductive biology characteristics of the goby *Boleophthalmus boddarti* (Pallas, 1770), in the Ben Tre coastal areas. Science and Technology Journal of Agriculture and Rural Development (ISSN:1859-4581), 12/2013: 175-1782.

TSQ640 FIELD STUDY AND SEMINAR

Course Description:

The purpose of this course is to organize field study and seminars for students to visit some protected areas and present different topics related to the field of Aquatic biodiversity and conservation to help them to self-search, think, and study. In addition to experiences and theoretical knowledge, during the field study and presentation, the students can also share their practical knowledge which they have ever experienced and learnt before. At the end of the course, the students can obtain knowledge, information



and experience that foster their understanding and skills which can be used and applied in practice for protecting and conserving aquatic biodiversity in the region.

Learning Outcomes:

- Master deeply and broadly knowledge in different fields of aquatic biodiversity and conservation
- Experience with practical situation and working experiences

Competences:

- Confident in communication
- Skilful in presentation and information exchange

Teachers' profile:

Vu Ngoc Ut, PhD, Associate Professor (see above)

Languages: Vietnamese

C: Elective courses

TSQ628 AQUATIC ANIMAL BIOLOGY AND ECO-TOXICOLOGY

Course Description:

The course introduces advanced knowledge of biology of aquatic animals and affected by environment and aquatic toxicology; providing new knowledge on (i) haematology, physiology and respiration of fish and crustacean and responses of fish to effects of environment; (ii) biological characteristics of selected species which are potential for aquaculture; (iii) bio-markers of exposure and effects by common toxicants in aquatic environment; (iv) advanced instruments/facilities to determine respiration and effects of selected environmental parameters (elevated temperature, CO₂, nitrite,...) on fish and shrimp; and (v) argument on the relationship of oxygen consumption and metabolism in the aquatic animals.

Learning Outcomes:

- Master deeply advanced biological knowledge;
- Master deeply advanced ecotoxicological knowledge;
- Apply advanced instruments/facilities to determine biological and physiological parameters of fish and shrimp species;
- Apply advanced instruments/facilities to determine biological responses of fish to toxicant such as organophosphate/carbamate pesticide *etc.*

Competences:

- Skilful in utilizing instruments for physiological and ecotoxicological tests on aquatic animals
- Assess and determine biological and physiological characters and status of a species
- Apply knowledge of advanced biology, physiology and ecotoxicology to practice for selecting potential species for aquaculture



Teachers' profile:

Duong Thuy Yen, PhD, Associate Professor (see above)

Do Thi Thanh Huong, PhD, Associate Professor

- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: dtthuong@ctu.edu.vn; Tel: +84 908670344
- Qualification: MSc in Aquaculture from Can Tho University, Vietnam; PhD in Aquatic Biosciences from The University of Tokyo, Japan.
- Teaching fields: Aquatic animal physiology
- Research fields: Fish, crustacean physiology under climate change impacts, exposure to toxicity of pesticides
- Recent publications:
 - Le Thi Hong Gam, Frank Bo Jensen, Christian Damsgaard, **Do Thi Thanh Huong**, Nguyen Thanh Phuong, Mark Bayley. (2017). Extreme nitrite tolerance in the clown knifefish *Chitala ornata* is linked to up-regulation of methaemoglobin reductase activity. *Aquatic Toxicology* 187 (2017) 9–17
 - Le My Phuong, **Do Thi Thanh Huong**., Nyengaard, J.R., Bayley, M., 2017. Gill remodelling and growth rate of striped catfish *Pangasianodon hypophthalmus* under impacts of hypoxia and temperature. *Comp. Biochem. Physiol. -Part A Mol. Integr. Physiol.* 203, 288–296.
 - Le My Phuong, Christian Damsgaard, **Do Thi Thanh Huong**, Atsushi Ishimatsu, Tobias Wang, Mark Bayley (2016). Recovery of blood gases and haematological parameters upon anaesthesia with benzocaine, MS-222 or Aqui-S in the air-breathing catfish *Pangasianodon hypophthalmus*. *Ichthyol Res.* DOI 10.1007/s10228-016-0545-4.
 - Schmitz M, Baekelandt S, Tran Thi L, Mandiki S, Douxfils J, Thinh N, **Do Thi Thanh Huong**, Kestemont P. Osmoregulatory and immunological status of the pond-raised striped catfish (*Pangasianodon hypophthalmus* S.) as affected by seasonal runoff and salinity changes in the Mekong Delta, Vietnam. *Fish Physiol. Biochem*, 2016 (accepted with revision)
 - Malthe HVas, Christian Damsgaard, Le Thi Hong Gam, **Do Thi Thanh Huong**, Frank B Jensen, Mark Bayley. (2016). The effect of environmental hypercapnia and size on nitrite toxicity in the striped catfish (*Pangasianodon hypophthalmus*). *Aquatic Toxicology* 176 : 151-160
 - Christian Damsgaard, Le Thi Hong Gam, Diem Tuong Dang, Phan Van Thinh, **Do Thi Thanh Huong**, Tobias Wang, Mark Bayley (2015). High capacity for extracellular acid-base regulation in the air-breathing fish *Pangasianodon hypophthalmus*. *Journal of Experimental Biology* 03/2015; DOI:10.1242/jeb.117671
 - Tran Minh Phu, Caroline Douny, Marie-Louise Scippo, Edwin De Pauw, Nguyen Quoc Thinh, **Do Thi Thanh Huong**, Huynh Phuoc Vinh, Nguyen Thanh Phuong, Anders Dalsgaard (2015). Elimination of



enrofloxacin in striped catfish (*Pangasianodon hypophthalmus*) following on-farm treatment. *Aquaculture* 03/2015; 438. DOI:10.1016/j.aquaculture.

- Christian Damsgaard, Le My Phuong, **Do Thi Thanh Huong**, Frank B Jensen, Tobias Wang, Mark Bayley. (2015). High affinity and temperature sensitivity of blood oxygen binding in *Pangasianodon hypophthalmus* due to lack of chloride-hemoglobin allosteric interaction. *Am J Physiol Regul Integr. Comp. Physiol.*; doi: 10.1152/ajpregu.00470.
- Rasmus Ern, **Do Thi Thanh Huong**, Nguyen Thanh Phuong, Peter Teglberg Madsen, Tobias Wang, Mark Bayley (2015). Some like it hot: Thermal tolerance and oxygen supply capacity in two eurythermal crustaceans. *Scientific Reports* 06/2015; 5:10743. DOI:10.1038/srep10743
- Margot Andrieu, Andreu Rico, Tran Minh Phu, **Do Thi Thanh Huong**, Nguyen Thanh Phuong, Paul J. Van den Brink (2015). Ecological risk assessment of the antibiotic enrofloxacin applied to *Pangasius* catfish farms in the Mekong Delta, Vietnam. *Chemosphere*, 119: 407-414
- Sjannie L., T. Wang, A. Jensen, N. V. Cong, **D.T.T. Huong**, N.T. Phuong and M. Bayley. (2014). Air-breathing fishes in aquaculture. What can we learn from physiology?. Review paper. *Journal of Fish Biology* doi:10.1111/jfb.12302.
- Phuc Trong Hong Nguyen, **Huong Thi Thanh Do**, Peter B Mather, David A Hurwood (2014). Experimental assessment of the effects of sublethal salinities on growth performance and stress in cultured tra catfish (*Pangasianodon hypophthalmus*). *Fish Physiology and Biochemistry*; 40(6). DOI:10.1007/s10695-014-9972-1
- Rasmus Ern, **Do Thi Thanh Huong**, Nguyen Thanh Phuong, Tobias Wang, Mark Bayley (2014). Oxygen delivery does not limit thermal tolerance in a tropical eurythermal crustacean. *The Journal of Experimental Biology*. 217: 1-6. doi:10.1242/jeb.094169.
- Sjannie Lefevre, Tobias Wang, **Do Thi Thanh Huong**, Nguyen Thanh Phuong, Mark Bayley (2013). Partitioning of oxygen uptake and cost of surfacing during swimming in the air-breathing catfish (*Pangasianodon hypophthalmus*). *J Comp Physiol B* 183:215–221

TSQ629 CLIMATE CHANGE AND ECOSYSTEM MANAGEMENT

Course Description:

The course will provide students knowledge on climate changes, assessment of impacts and effects of climate changes on ecosystems. Concepts on ecology and measures for ecosystem management under climate changes are also provided.

Learning outcomes:

- Master deeply concepts, principles and effects of climate change impacts on ecosystems.



- Understand concepts and approaches for ecosystem management under climate changes
- Apply knowledge of ecosystem management and climate changes to propose adaptation strategies for ecosystems
- Analyse and assess issues from different aspects to propose specific solutions in managing ecosystems under climate changes

Competences:

- Determine status of an ecosystem under climate change impacts
- Assess impacts of climate changes on ecosystems
- Propose appropriate measures for ecosystem management

Teachers' profile:

Huynh Truong Giang, PhD

- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: htgiang@ctu.edu.vn
- Qualification: PhD in Aquaculture at National Pingtung University of Science Aquaculture and Technology Taiwan
- Teaching fields: water quality management, Analytical methods
- Research fields: water quality, probiotics, prebiotics
- Recent publications:
 - Shiu Y.L., Chi C.C., **Huynh T.G.**, Liu C.H., Yeh S.P., 2017. Potential use of plasma water technology for controlling disease and water quality management in aquaculture. 10th Symposium on Disease in Asian Aquaculture (DAA10), Bali, Indonesia, 28 August- 1 September, 2017.
 - Ut, V.N., **Huynh, T.G.**, Phu, T.Q., Morales, J. and Phuong, N.T. (2016). Assessment of water quality in catfish (*Pangasianodon hypophthalmus*) production systems in the Mekong Delta. Can Tho University Journal of Science. 3: 71-78.
 - Nguyen Thi Kim Lien, **Huynh Truong Giang** and Vu Ngoc Ut (2014). Zoobenthos composition in Hau River. Journal of Science, Can Tho University, 2: 239-247. *In Vietnamese*.
 - Nguyen Thi Kim Lien, **Huynh Truong Giang** and Vu Ngoc Ut (2013). Zooplankton biodiversity in the Cu Lao Dung mangrove, Soc Trang province. Journal of Science, Can Tho University, vol. 25: 149-157. *In Vietnamese*.
 - Duong Thi Hoang Oanh, **Huynh Truong Giang** and Nguyen Thi Kim Lien, 2014. Fluctuation of phytoplankton community in intensive white leg shrimp (*Litopenaeus vannamei*) ponds referring to shrimp health status. Scientific Journal of Can Tho University. 2:159-168.
 - Vu Ngoc Ut, Duong Thi Hoang Oanh and **Huynh Truong Giang**, 2013. Species composition and abundance of algae in the salt and Artemia



production areas of the coast of Vinh Chau, Soc Trang. Collection of Marine Research Works. Vietnam Institute of Oceanography. 19:202-214.

- Nguyen Thi Kim Lien, **Huynh Truong Giang**, Vu Ngoc Ut, 2013. Zooplankton communities biodiversity in the Cu Lao Dung mangrove, Soc Trang province. Scientific Journal of Can Tho University. 25:149-157.
- Duong Thi Hoang Oanh, Nguyen Thi Kim Lien, **Huynh Truong Giang**, 2013. Effect of temperature, density and type of algae on the filtration rate of blood-cockle (*Anadara granosa*) Linne,1758. Scientific Journal of Can Tho University. 25:158-167.

Languages: Vietnamese

TSQ630 ENVIRONMENT ECOLOGY

Course Description:

The course introduces knowledges of effects of environmental stresses and other disturbances on ecology.

Learning Outcomes:

- Understand knowledge on effects of stresses such as air pollution, acidification, warfare, pesticide use on ecology.
- Understand knowledge on biodiversity, extinction and conservation acts.

Competences:

- Skilful in seminar presentation
- Handle and assess the status of environment

Teachers' profile:

Nguyen Van Cong, Associate Professor, Ph.D.

- Working institution: College of Environment and Natural Resources, Can Tho University (Vietnam)
- Contacts: nvcong@ctu.edu.vn
- Qualification: MSc in Environment Science from Chiang Mai University, Thailand; PhD. in Ecotoxicology from Aarhus University, Denmark
- Teaching fields:
- Research fields:
- Recent publications:
 - Nguyen Thanh Tam, Håkan Berg and **Nguyen Van Cong** (2016). Evaluation of the joint toxicity of chlorpyrifos ethyl and fenobucarb on climbing perch (*Anabas testudineus*) from rice fields in the Mekong Delta, Vietnam. Environ Sci Pollut Res. Ecotoxicology In Tropical Regions DOI 10.1007/s11356-016-6980-y
 - Nguyen Thanh Tam, Håkan Berg, Jenny Laureus, **Nguyen Van Cong**, Michael Tedengren (2016). Effects of Sequential Applications of Bassa 50EC (Fenobucarb) and Vitashield 40EC (Chlorpyrifos ethyl)



- on Acetylcholinesterase Activity in Climbing Perch (*Anabas testudineus*) Cultured in Rice Fields in the Mekong Delta, Vietnam. *Bull Environ Contam Toxicol* 97, 98–104
- Trang T. Nhu, Jo Dewulf, Pieterjan Serruys, Sophie Huysveld, **Cong V. Nguyen**, Patrick Sorgeloos, Thomas Schaubroeck (2015). Resource usage of integrated Pig–Biogas–Fish system: Partitioning and substitution within attributional life cycle assessment. *Resources, Conservation and Recycling* 102, 27–38
 - Tam Thanh Nguyen, Håkan Berg, Hang Thi Thuy Nguyen, **Cong Van Nguyen** (2015). Effects of chlorpyrifos ethyl on acetylcholinesterase activity in climbing perch cultured in rice fields in the Mekong Delta, Vietnam. *Ecotoxicology and Environmental Safety* 117, 34–40
 - Nguyen Thanh Tam, Håkan Berg, Phan Thi Bich Tuyen, **Nguyen Van Cong** (2015). Effect of Chlorpyrifos Ethyl on Acetylcholinesterase Activity in Climbing Perch (*Anabas testudineus*, Bloch, 1972). *Arch Environ Contam Toxicol* DOI 10.1007/s00244-015-0182-3
 - R. Ern, D. T. T. Huong, **N. V. Cong**, M. Bayley and T. Wang (2014). Effect of salinity on oxygen consumption in fishes: a review. *Journal of Fish Biology* Volume 84, Issue 4, 1210–1220.
 - S. Lefevre, T. Wang, A. Jensen, **N. V. Cong**, D. T. T. Huong, N. T. Phuong and M. Bayley (2014). Air-breathing fishes in aquaculture. What can we learn from physiology? *Journal of Fish Biology* Volume 84, Issue 3, 705–731
 - Nina K. Iversen, Henrik Lauridsen, Do Thi Thanh Huong, **Nguyen Van Cong**, Hans Gesser, Rasmus Buchanan, Mark Bayley, Michael Pedersen, Tobias Wang (2013). Cardiovascular anatomy and cardiac function in the air-breathing swamp eel (*Monopterus albus*). *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology, Volume 164, Issue 1, 171-180*
 - Rasmus Ern, Do Thi Thanh Huong, **Van Cong Nguyen**, Tobias Wang and Mark Bayley (2012). Effects of salinity on standard metabolic rate and critical oxygen tension in the giant freshwater prawn (*Macrobrachium rosenbergii*). *Aquaculture research*, Volume 44, Issue 8, 1259–1265,

Languages: Vietnamese

TSQ632 SUSTAINABLE FISHERIES MANAGEMENT

Course Description:

Sustainable fisheries management course will provide for students the knowledge on the fisheries resources, fish population dynamics, and fisheries monitoring and management in order to use fisheries resources sustainability.

Learning Outcomes:

- Obtain the basic dynamics of fish population and fish abundance.

- Understand the fisheries management objectives and regulations for sustainable use

Competences:

- Determine fish stock abundance
- Determine fish population parameters and maximum/optimum exploitation rates.

Teachers' profile:

Tran Duc Dinh, PhD, Associate Professor (see above)

Languages: Vietnamese

TSQ637 IMPACT OF HYDROPOWER DAMS ON AQUATIC BIODIVERSITY

Course Description:

The course will provide knowledge on the impacts of hydropower dams on biodiversity in the ecosystems, ecosystem services as well as socio-economic issues in the Mekong river. In addition, course also provides the knowledge on the changes of water quality, water flow, and habitats on the lower Mekong basin under influences of hydropower dams.

Learning Outcomes:

- Master knowledge on the components of freshwater ecosystems, Mekong river especially.
- Understand deeply the advantages and disadvantages of development of hydropower dams along Mekong River.
- Analyse and evaluate impacts of hydropower dams, propose approaches for management.
- Propose measures to reduce impacts of hydropower dams to socio-economic issues in the lower Mekong basin.
- Propose measures to reduce impacts of hydropower dams on aquatic ecosystems

Competences:

- Identify the impacts of hydropower dams on biodiversity in Mekong river
- Identify the impacts of hydropower dams on socio-economic issues in the lower Mekong basin
- Manage impacts of hydropower dams on the biodiversity, water quality of the Mekong river that affect livelihood in the Lower Mekong region.

Teachers' profile:

Van Pham Dang Tri, PhD, Associate Professor

- Working institution: College of Environment and Natural Resources, Can Tho University (Vietnam)
- Contacts: ypdtri@ctu.edu.vn



- Qualification: PhD. in Physical Geography at Southampton University, the UK
- Teaching fields: Water modelling, hydrological dynamics
- Research fields: Modelling, mapping, hydrology
- Recent publications:
 - Hanington, P., To Quang Toan, **Van Pham Dang Tri**, Vu Doan Ngoc Anh, A.S. Kiem (2017). A hydrological model for interprovincial water resource planning and management: a case study in the Long Xuyen Quadrangle, Mekong Delta, Vietnam. *Journal of Hydrology*, 547, 1-9, doi: <http://dx.doi.org/10.1016/j.jhydrol.2017.01.030>.
 - Roel, H.B., Ngo The An, Huynh Van Chuong, Le Thi Huong, Dang Kieu Nhan, **Van Pham Dang Tri**, H. van Gerardo (2016). Seven steps in identifying local climate change responses for agriculture in Vietnam. *Tropicultura*, 34_NS, 31-49.
 - Dang KN., To LP., Nguyen NS., Vo VH., Nguyen HT., **Van Pham Dang Tri**, Nguyen HT., Bosma RH., van Halsema G. (2016). Climate Change Adaptation Strategies for Freshwater Agriculture in the Coastal Mekong Delta: Farm-scale Opportunities and Water Management Challenges, *Tropicultura*, 34_NS, 120.
 - Hiroshi T., **V.P.D Tri**, T.V. Ty, N.D. Thao, L.T. Anh, G.V. Vinh (2016). Flow intensification induced by tidal oscillations in tributaries of the Mekong River *Int. J. of Safety and Security Eng.* 6 (3), 697–703.
 - Dang, D.T., Cochran A.T., Arias E.A., **Van P.D.T.** and De-Vries T. (2016). Hydrological alterations from water infrastructure development in the Mekong floodplains. *Hydrological Processes*. doi: 10.1002/hyp.10894.
 - Hak, D., K. Nadaoka, L.P. Bernado, V.L. Phu, N. H. Quan and T.Q. Toan, N.H. Trung, D.V. Ni, and **V.P.D. Tri** (2016). Spatio-temporal variations of sea level around the Mekong Delta: their causes and consequences on the coastal environment. *Hydrological Research Letters* 10(2), 60–66, doi: 10.3178/hrl.10.60.
 - Chapman A.D., Stephen E., Hong M.H., Emma L.T., and **Van P.D.T.** (2016). Identifying an emergent risk: sediment service loss in the Vietnamese Mekong Delta. *Climatic Change*, 1 - 34. DOI 10.1007/s10584-016-1684-3.
 - Hiroshi., T., Tsurudome C. , Nguyen D.T., Le T.A., Tran V.T., and **Van P.D.T.**, (2016). Ocean tidal modelling for urban flood risk assessment in the Mekong Delta. *Hydrological Research Letters*. Vol. 10, No. 1, 21-26. <http://doi.org/10.3178/hrl.10.21>.
 - Joffre, O. M., Bosma, R. H., Ligtenberg, A., **Tri, V. P. D.**, Ha, T. T. P., and Bregt, A. K. (2015). Combining participatory approaches and an



agent-based model for better planning shrimp aquaculture. *Agricultural Systems*, 141, 149–159. <http://doi.org/10.1016/j.agsy.2015.10.006>.

- Nowacki, D. J., A. S. Ogston, C. A. Nittrouer, A. T. Fricke, and **D. T. Van Pham** (2015), Sediment dynamics in the lower Mekong River: Transition from tidal river to estuary, *J. Geophys. Res. Oceans*, 120, doi:10.1002/2015JC010754.
- Smajgl A., To Toan, Dang Nhan, John Ward, Nguyen Trung, Le Tri, **Van Tri**, and Pham Vu (2015). Responding to rising sea-levels in Vietnam's Mekong Delta. *Nature Climate Change*; DOI: 10.1038/NCLIMATE2469.
- **Van Pham Dang Tri**, Nguyen Hieu Trung, Vo Quoc Thanh (2013). Vulnerability to flood in the Vietnamese Mekong Delta: Mapping and uncertainty assessment. *Journal of Environmental Science and Engineering*

Languages: Vietnamese

TSQ638 ENVIRONMENTAL IMPACTS AND RISKS ASSESSMENT

Course Description:

This course is designed to provide the principles, concepts and methodologies for assessing risks and impacts of project activities on biodiversity, socio-economic issues. Students are also developed skills for preparation of an environmental and social impact and risk assessment report.

Learning Outcomes:

- Understand the concepts and principles of ecology, sustainable development, environmental impact assessment (EIA) and environmental risk assessment (ERA)
- Master the rules, regulations and implementing guidelines of environmental impact assessment in Vietnam. Know the process and methodologies of EIA and ERA.
- Develop a comprehensive framework for predicting concentrations of contaminants in the environment, and for evaluating the resulting exposures, impacts, and human health risks.
- Understand the framework of social impact assessment
- Master the ways and strategies on how to mitigate and monitor the environmental impacts of proposed projects.
- Integrate material from other courses, such as toxicology, risk assessment, computer applications, and statistics.

Competences:

- Ability to the develop the framework for predicting concentrations of contaminants in the environment and framework of social impact assessment



- Ability to propose the strategies for monitoring the environmental impacts.
- Ability to prepare the environmental and social impact and risk assessment reports

Teachers' profile:

Huynh Truong Giang, PhD

- Working institution: College of Aquaculture and Fisheries, Can Tho University (Vietnam)
- Contacts: htgiang@ctu.edu.vn
- Qualification: PhD in Aquaculture at National Pingtung University of Science Aquaculture and Technology Taiwan
- Teaching fields: water quality management, Analytical methods
- Research fields: water quality, probiotics, prebiotics
- Recent publications:
 - Shiu Y.L., Chi C.C., **Huynh T.G.**, Liu C.H., Yeh S.P., 2017. Potential use of plasma water technology for controlling disease and water quality management in aquaculture. 10th Symposium on Disease in Asian Aquaculture (DAA10), Bali, Indonesia, 28 August- 1 September, 2017.
 - Ut, V.N., **Huynh, T.G.**, Phu, T.Q., Morales, J. and Phuong, N.T. (2016). Assessment of water quality in catfish (*Pangasianodon hypophthalmus*) production systems in the Mekong Delta. Can Tho University Journal of Science. 3: 71-78.
 - Nguyen Thi Kim Lien, **Huynh Truong Giang** and Vu Ngoc Ut (2014). Zoobenthos composition in Hau River. Journal of Science, Can Tho University, 2: 239-247. *In Vietnamese*.
 - Nguyen Thi Kim Lien, **Huynh Truong Giang** and Vu Ngoc Ut (2013). Zooplankton biodiversity in the Cu Lao Dung mangrove, Soc Trang province. Journal of Science, Can Tho University, vol. 25: 149-157. *In Vietnamese*.
 - Duong Thi Hoang Oanh, **Huynh Truong Giang** and Nguyen Thi Kim Lien, 2014. Fluctuation of phytoplankton community in intensive white leg shrimp (*Litopenaeus vannamei*) ponds referring to shrimp health status. Scientific Journal of Can Tho University. 2:159-168.
 - Vu Ngoc Ut, Duong Thi Hoang Oanh and **Huynh Truong Giang**, 2013. Species composition and abundance of algae in the salt and Artemia production areas of the coast of Vinh Chau, Soc Trang. Collection of Marine Research Works. Vietnam Institute of Oceanography. 19:202-214.
 - Nguyen Thi Kim Lien, **Huynh Truong Giang**, Vu Ngoc Ut, 2013. Zooplankton communities biodiversity in the Cu Lao Dung mangrove, Soc Trang province. Scientific Journal of Can Tho University. 25:149-157.



- Duong Thi Hoang Oanh, Nguyen Thi Kim Lien, **Huynh Truong Giang**, 2013. Effect of temperature, density and type of algae on the filtration rate of blood-cockle (*Anadara granosa*) Linne,1758. Scientific Journal of Can Tho University. 25:158-167.

Languages: Vietnamese

TSQ642 WATER QUALITY MODELLING

Course Description:

The course is developed to get the students acquainted with the basics of surface water quality modelling for better management of deltaic river networks, which is to get knowledge on the basic transport and transformation processes on which the water quality models are based. The specific objectives of the course include:

- Understanding the basic principles of transport and transformation processes of water quality in a surface water body.
- Understanding of the system's approach to managing the aquatic environment (with the meaning that a tool describing the response of aquatic systems to natural and anthropogenic inputs to enable the efficient management of the water-environment).
- Applying a numerical model to understand the changes of surface water quality given changes of the boundary conditions and carry out a series of management-planning exercises (a kind of simulation of the actual work in managing the aquatic environment and assessing environmental impacts).

Learning Outcomes:

- Understand water quality processes in a river network in a deltaic river system;
- Understand the principles of the system dynamics approach in water quality processes and impacts of management strategies;
- Apply numerical modelling in the Integrated Water Resources Management in the process aiming at efficient water resources management in the context of water scarcity.

Competences:

- Run a 1D hydrodynamics model to simulate water quality given impacts of boundary condition changes.

Teachers' profile:

Van Pham Dang Tri, Associate Professor, Ph.D. (see above)

Languages: Vietnamese

TS645 BIO-MONITORING IN AQUATIC ENVIRONMENT



Course Description:

The course will provide knowledge on biomonitoring, bioindicators, aquatic organisms used as bioindicators, biological indices used in biomonitoring, rapid assessment on water quality of an aquatic ecosystem. Details on bioindicators, biomonitoring methodologies, indices... will be mentioned in this syllabus.

Learning Outcomes:

- Master knowledge on biomonitoring, bioindicator species compositions and features
- Apply bio-indices, methodologies and interpretation in bio-monitoring the aquatic environments
- Analyse and evaluate aquatic organism diversity and water quality
- Propose measures for management, protection and restoration of highly potential polluted ecosystems

Competences:

- Identify groups of invertebrates for bio-indicators
- Utilize proficiently different bio-indices to assess the diversity and environment
- Apply relevant biomonitoring method in appraising water quality

Teachers' profile:

Vu Ngoc Ut, PhD, Associate Professor (see above)

Languages: Vietnamese

TSQ615 WATER QUALITY MANAGEMENT IN AQUACULTURE SYSTEMS**Course Description:**

This course will introduce issues of water quality management in rivers, estuaries, and oceans. The course will address questions related to water quality, characteristics of waters, and impairment of aquatic ecosystems. This course will explore the physical, chemical, and biological aspects of water and wastewater quality. Concepts on how to determine water quality via the examination of physical, chemical and biological indicators will be introduced. Students will develop an understanding of the causes and consequences of, as well as solutions to, diverse types of water pollution that impacts ecosystems.

Learning Outcomes:

- Understand important factors in water quality management in ecosystem
- Master the spatial and temporal patterns of water quality in aquatic environment
- Understand the interactions of water quality and aquatic animal life
- Understand reasonable methods for water quality management in ecosystems
- Utilize monitoring methods to assess water quality in various types of ecosystems.
- Synthesize concepts, particularly in terms of how changes in behavior and proper management can protect water resources.



Competences:

- Collecting water sample
- Analysing water parameters in laboratory
- Interpreting water parameters
- Proposing measure for water quality management

Teachers' profile:

Huynh Truong Giang, PhD (see above)

Languages: Vietnamese

AQ649 NATURAL RESOURCE ECONOMICS AND ENVIRONMENT**Course Description:**

Environmental and Natural Resource economics is designed to enable students to understand the linkages between economic activities and the environment and vice versa. It discusses the theories and the tools that can be used to understand and measure said relationships so that appropriate decisions on how best to manage the environment and the natural resources can be identified.

Learning Outcomes:

- Understand the linkages between the various environmental (E) & natural resource (NR) problems and the economic activities that affect them;
- Learn how these E & NR problems could be addressed using appropriate economic instruments and institutional/property rights reforms;
- Gain familiarity on the various valuation techniques that could be used to monetize environmental impacts of economic activities/ programs/ policies; and
- Appraisal how benefit cost analysis can be applied in evaluating various resource/environmental management options.

Competences:

- Calculate and determine value of the resources
- Assess the benefit brought from natural resources if invested properly

Teachers' profile:

Huynh Viet Khai, PhD

- Working institution: College of Economics and business administration, Can Tho University (Vietnam)
- Contacts: hvkhai@ctu.edu.vn
- Qualification: MSc in Agricultural and Resource economics at Kyushu University, Japan; PhD in Agricultural and Resource economics at Kyushu University, Japan
- Teaching fields: economics, natural resource economics and environment
- Research fields: Agriculture and industry, cost-benefit analysis, climate change impact on agriculture products
- Recent publications:



- Huynh Viet Khai, Vo Thanh Danh, Vu Thuy Duong and Mitsuyasu Yabe “Drainage Improvement Project: Cost and Benefit Analysis in the Mekong Delta, Vietnam”, *Journal of the Faculty of Agriculture, Kyushu University*, Vol 62 (1), pp. 189-195, 1/2017 (*ISI journal*).
- Vo Hong Tu, Mitsuyasu Yabe, Nguyen Thuy Trang and Huynh Viet Khai “Environmental Efficiency of Ecologically Engineered Rice Production in the Mekong Delta of Vietnam”, *Journal of the Faculty of Agriculture, Kyushu University*, Vol. 60 (2), pp. 93-500, 6/2015 (*ISI journal*).
- Huynh Viet Khai and Mitsuyasu Yabe “Estimating Consumer Preferences for Agricultural Products Considering the Value of Biodiversity Conservation”, *Journal of Nature Conservation*, Vol. 25, pp. 62-71, 5/2015 (*Elsevier publishing, ISI journal*).
- Huynh Viet Khai “Assessing consumer preferences for organic vegetables: A case study in the Mekong Delta, Vietnam”, *Information Management and Business Review*, Vol. 7 (1), pp. 41-47, 2/2015 (*Cabell’s International, EBSCOHost index*).
- Huynh Viet Khai and Mitsuyasu Yabe “Choice modeling: assessing the non-market environmental values of the biodiversity conservation of swamp forest in Vietnam”, *International Journal of Energy and Environmental Engineering*, Vol. 5(1), pp. 1 – 8, 3/2014 (*Springer publishing, ISI journal*).

TS640 PROJECT FORMULATION AND APPRAISAL

Course Description:

This course will provide knowledge on project concepts, appraisal process and appraisal approaches. Approaches for financial analysis, opportunistic and beneficial costs of project will be also offered. At the meantime, risks and prevention of risks during the appraisal process will be displayed.

Learning Outcomes:

- Master deeply the knowledge on project development, appraisal process and approaches
- Determine project assessment parameters and selection and appraisal for socio-economic efficiency
- Structure and develop an investment project
- Appraisal an investment project

Competences:

- Capable to develop and design an investment project
- Capable to appraisal an investment project



Teachers' profile:

Nguyen Thanh Phuong, PhD, Professor (see above)

TSQ636 AQUACULTURE AND BIODIVERSITY CONSERVATION**Course Description:**

The course will introduce the general development of aquaculture; characteristics and advances in aquaculture; potential and impacts of aquaculture, particularly to biodiversity and aquatic resources. The course will also address to the strategies and solution to the issues. The course includes theory and different assignments. It is expected that the courses will contribute to improving student's knowledge as well as responsible activities in aquaculture for sustainable development.

Learning Outcomes:

- Understand about the development of aquaculture, potential and impacts of aquaculture particularly to aquatic biodiversity and resources
- Understand better about responsible aquaculture.

Competences:

- Know how to evaluate the current issues in aquaculture.
- Know how to prepare a research project proposal for responsible aquaculture
- Work individually, group working, report writing and presentation of different assignments

Teachers' profile:

Tran Ngoc Hai, PhD, Professor (see above)

Languages: Vietnamese

TSQ602 AQUATIC RESOURCES**Course Description:**

The course will provide knowledge on diversity of aquatic organisms, their biological, ecological characteristics, importance and application in water quality assessment as well as roles in aquaculture. The compositions of aquatic organisms include invertebrates (plankton and benthos), vertebrates (fish, amphibians, mammals...), and endangered species in the Mekong Delta and Vietnam.

Learning Outcomes:

- Master the species composition and diversity of aquatic organisms
- Understand firmly their biological, ecological characteristics, role and importance



- Analyse and assess their diversity in the aquatic ecosystems
- Apply their biological, ecological characteristics as the indicators for biomonitoring to assess the water quality in ecosystems.
- Propose appropriate measures for protection, conservation of the resource, especially important and valuable species

Competences:

- Calculate and interpret bio-indices to assess water quality
- Analyse and assess the status of aquatic biodiversity

Teachers' profile:

Vu Ngoc Ut, PhD, Associate professor (See above)

D: Research courses

TSQ625 RESEARCH METHODOLOGY AND APPLIED STATISTICS IN AQUATIC RESOURCE MANAGEMENT

Course Description:

The aim of the course is to provide the students the theoretical and practical knowledge and skills in scientific research concept, writing research proposal, reviewing scientific literature, preparing scientific paper/report/thesis, presenting research results in oral and poster; knowledge and skills in experimental design and statistical analysis of data in ecology.

Learning Outcomes:

- Understand principles of scientific research;
- Prepare a research proposal
- Implement a research work
- Understand correct ways to review and to cite scientific literature
- Present research results in oral and poster
- Apply principles in experimental design and statistical analysis

Competences:

- Explain different research concepts
- Perform literature review and citation
- Formulate a research proposal and conduct a research project
- Prepare a scientific paper/report/thesis
- Present research results at conference and thesis defense
- Design experiments
- Analyze data using common statistical software



Teachers' profile:

Nguyen Thanh Phuong, PhD, Professor (see above)

- **Languages:** Vietnamese

TSQ896 PRESENTATION I (PLANNING)**Course Description:**

In this presentation the students will be guided to prepare the research proposal with standard format containing all parts related to a graduation thesis. After finishing the proposal, students will have to defence their research contents and plan to a jury committee for comments and recommendations before implementation.

Competences:

- Prepare a research proposal
- Structure a research proposal
- Defence a research proposal

TSQ897 PRESENTATION II (INTERMEDIATE)**Course Description:**

The students will be guided to write and submit the midterm report and preliminary assessment of the research results will be conducted to adjust the research contents, if necessary.

Competences:

- Prepare a report of research
- Present report of research

TSQ898 PRESENTATION III (CONFERENCE)**Course Description:**

The students will be supervised to conduct their research in the lab or in the fields. At the same time, students have to join seminars organized regularly in the university

Competences:

- Design experiments
- Monitor experimental parameters
- Collect and sample data
- Analyse samples and data



TSQ899 LABORATORY SEMINAR

Course Description:

The students have to prepare research data to attend conference or symposiums organized locally or in other universities with oral or poster presentation.

Competences:

- Analyse data
- Write an abstract for scientific paper
- Present a scientific research at a conference

Teachers' profile:

All teachers involved

E: Thesis

Thesis - Credits:

Students will be provided 25 credits for doing research for their graduation thesis. Research topics are either provided by professors or proposed by the students. During the course of research implementation, the students will be closely supervised by their promoters or supervisors to conduct experiments or field works. This course covers 5 different components including (i) Planning (research proposal preparation and defense); Intermediate implementation (midterm reporting, preliminary assessment of research results, adjusting research contents, if any); (iii) research implementation and seminar participation; (iv) Conference/symposium attendance; and (v) Thesis writing and defense.

Competences

- Demonstrate considerably more in-depth knowledge of the selected field of study
- Demonstrate deeper knowledge of methods in the major subject/field of study.
- Plan and use adequate methods to conduct assigned tasks with high quality.
- Contribute to research and development work.
- Analyse and evaluate problems.
- Identify and address the related issues.
- Perform a consciousness of the ethical aspects of research and development work.

Teachers' profile:

All teachers involved

Languages: Vietnamese

