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:

<table>
<thead>
<tr>
<th>Research group code</th>
<th>Research group name</th>
<th>Number of members</th>
<th>Number of projects*</th>
<th>Number of agreements*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTU Aquatic resources</td>
<td>Resources, Biodiversity, Taxonomy</td>
<td>6</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>CTU Aquatic environment and ecology</td>
<td>Aquatic Environment Monitoring, Ecology, Aquatic invertebrates</td>
<td>10</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>CTU Environment and natural</td>
<td>Environment, Natural resources,</td>
<td>10</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>
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
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 Mongcut 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

<table>
<thead>
<tr>
<th>Codes</th>
<th>Course required by MOET regulation</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML605</td>
<td>Philosophy</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>i. Core courses</strong></td>
<td></td>
</tr>
<tr>
<td>AQ604</td>
<td>Tropical aquatic ecosystems</td>
<td>2</td>
</tr>
<tr>
<td>TSQ626</td>
<td>Conservation Biology</td>
<td>2</td>
</tr>
<tr>
<td>TSQ627</td>
<td>Aquatic population genetics and biodiversity</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>ii. Major courses</strong></td>
<td></td>
</tr>
<tr>
<td>TSQ631</td>
<td>Fish stock assessment and fisheries management</td>
<td>2</td>
</tr>
<tr>
<td>AQ647</td>
<td>Responsible aquaculture and fisheries</td>
<td>2</td>
</tr>
<tr>
<td>TS649</td>
<td>GIS application in aquatic resource management</td>
<td>2</td>
</tr>
</tbody>
</table>
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: vnut@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:

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:

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: thuyyen@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:
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:
- 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.

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:


Nguyen Thanh Phuong, PhD, Professor

- 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:
  - Yuichi Kano, David Dudgeon, So Nam, Hiromitsu Samejima, Katsutoshi Watanabe, Chaawut Grudpan, Jarungjit Grudpan, Wichan Magtoon,


Rasmus Ern, Do Thi Thanh Huong, Nguyen Thanh Phuong, Peter Teglborg 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.


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**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:
  o 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

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


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:
  o 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.


○ 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
  - 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)
  - 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.


- Rasmus Ern, Do Thi Thanh Huong, Nguyen Thanh Phuong, Peter Teglborg 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


- 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


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:
  - Vu Ngoc Ut, Duong Thi Hoang Oanh and **Huynh Truong Giang**, 2013. Species composition and abundance of algae in the salt and Artemia


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 Aahrus University, Denmark

- Teaching fields:
- Research fields:
- Recent publications:
  - 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)


- 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 Dac 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: vpdtri@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:


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:**

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

Co-funded by the Erasmus+ Programme of the European Union
**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:**

Vũ Ngọc Ưt, PhD, Associate Professor (see above)

**Languages:** Vietnamese

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**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:


**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
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 litterature, 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

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