

COURSE OUTLINE DETAILS

1. Course: Water Science (Khoa học môi trường nước)

- **Code number:** AQ207

- **Credits:** 3

- **Hours:** 45 theory hours and 90 self-study hours

2. Management Unit:

- **Department:** Applied Hydrobiology

- **Faculty:** College of Aquaculture and Fisheries

3. Requisites:

- **Prerequisites:** No

- **Corequisites:** AQ218

4. Course objectives:

Objectives	Descriptions	Program Outcomes
4.1	To provide the knowledge on the crucial water quality parameters for aquatic animals, the interactions of water quality and aquatic animal life, and methods for controlling within suitable ranges for aquaculture species.	2.1.2.a 2.1.3.b
4.2	To train the professional skills on water quality assessment based on the water quality analysis data and scholarly ability to propose the methods for water quality management in aquaculture production systems.	2.2.1.a
4.3	To develop the ability to work independently or/and in groups, well working on presentation.	2.2.2
4.4	To raise student's awareness on lifelong learning skills; and competence for academic specialization and professional experiences in practical works in aquaculture field.	2.3

5. Course learning outcomes:

COs	Descriptions	Objectives	POs
	Knowledge		
CO1	Understand the properties of water, hydrology cycle, water quality processes and variables	4.1	2.1.2.a 2.1.3.b
CO2	Describe the water quality requirements and important features in water quality management in aquaculture ponds	4.1	2.1.2.a
	Skills		

COs	Descriptions	Objectives	POs
CO3	Analyze the water quality in aquatic environment based on water quality data	4.2	2.2.1.a
CO4	Propose the methods for water quality management in aquatic environment	4.2	2.2.1.a
CO5	Work independently or/and in groups using English, well working on presentation.	4.3	2.2.2
	Attitudes/Autonomy/Responsibilities		
CO6	Develop self-studying ability, scientific style in learning and research, lifelong learning skills.	4.4	2.3

Note: "COs" means Course Outcomes; "POs" means Program Outcomes

6. Brief description of the course:

The module "Water science" provides advanced aquaculture undergraduate students knowledge about the properties of water, water quality processes and variations. On successful completion of the module, students will gain knowledge about the effects of water quality on aquatic animals and the proper methods for water quality management in aquaculture ponds.

7. Course structure:

7.1. Theory

	Content	Hours	COs
Chapter 1.	Properties of water	3	CO1; CO5; CO6
1.1.	Density		
1.2.	Surface Phenomena		
1.3.	Viscosity		
1.4.	Dielectric Constant		
Chapter 2.	Hydrology	3	CO1; CO5; CO6
2.1.	Evaporation		
2.2.	Water cycle		
2.3.	Water flow and measurement		
2.4.	Water loss in aquaculture ponds		
2.5.	Stratification		
2.6.	Eutrophication		
2.7.	Viscosity		
Chapter 3.	Physical components	6	CO1; CO5; CO6
3.1.	Light		
3.2.	Transparency		
3.3.	Turbidity		
3.4.	Solids in water		
3.5.	Conductivity		
3.6.	Ion composition in freshwater and seawater		
3.7.	Temperature		

	Content	Hours	COs
3.8.	Salinity		
3.9.	Color		
Chapter 4.	Chemical components	15	CO1; CO5; CO6
4.1.	pH		
4.2.	CO ₂		
4.3.	Alkalinity		
4.4.	Hardness		
4.5.	Dissolved oxygen (DO)		
4.6.	Redox potential (RP)		
4.7.	Chemical Oxygen Demand (COD)		
4.8.	Biological Oxygen Demand (BOD)		
4.9.	Nitrogen (NH ₃ , NH ₄ ⁺ , NO ₂ ⁻ , NO ₃ ⁻)		
4.10.	Phosphorus (P)		
4.11.	Sulfur (S)		
4.12.	Trace elements		
Chapter 5.	Biological components	3	CO1; CO5; CO6
5.1.	Microscopy (bacteria and fungi)		
5.2.	Plants (algae, mosses, macrophytes)		
5.3.	Invertebrates		
5.4.	Vertebrates		
Chapter 6.	Water quality management	15	CO2, CO3, CO4, CO5 CO6
6.1.	Water quality criteria in aquaculture ponds		
6.2.	Fertilization		
6.3.	Liming		
6.4.	Aeration		
6.5.	Biological and chemical treatments		

7.2. Practice: No

8. Teaching methods:

- Active teaching and learning offer opportunities for interaction between lecturers and students, among the students themselves, as well as between students and the materials, the topic itself or the academic discipline.
- Students are expected to read the lesson before class, and participate in discussion during class. At the end of each class, the lecturer expresses the explanation of core issues of the lesson.
- Each student selects one topic in the list of topics that are proposed by lecturers and presents personally. After the presentation, students are asked to communicate how and why regarding the topic in the class.

9. Duties of student:

Students have to do the following duties:

- Preparing and participating the seminar presentations

- Participating in the mid-term exam.
- Physical participation in the final exam.
- Independent study activities

10. Assessment of course learning outcomes:

10.1. Assessment

No.	Point components	Rules and Requirements	Weights	COs
1	Presentation	Prepare and personally present a selected topic (15 min-presentation and 5 min-Q&A)	20%	CO3, CO4, CO5
2	Mid-term exam	Participating the midterm exam (30 minutes, multiple choice)	30%	CO1, CO2
3	Final test	Participating the midterm exam (60 minutes, multiple choice + assay)	50%	CO1, CO2, CO4, CO5, CO6

10.2. Grading

- Grading components and final test scores will be marked on a scale of 10 (0 to 10), rounded to one decimal place.
- Course score is the sum of all the components of the evaluation multiplied by the corresponding weight. The course score is marked on a scale of 10 and rounded to one decimal place, then it is converted to A-B-C-D score and score on a scale of 4 under the academic regulations of the University.

11. Learning materials:

Learning materials information	Barcode number
[1] Boyd, C.E., 2015. Water quality: an introduction. Springer Publisher. 374 pages.	TS.005719
[2] Boyd, C.E. 1990. Water quality in ponds for aquaculture. Birmingham Publishing Co., Birmingham, USA. 482 pp.	TS. 004677
[3] Boyd, C.E. 1998. Water quality for fond aquaculture. Birmingham Publishing Co., Birmingham, USA. 37 pages.	TS.003885

12. Self-study Guide:

Week	Content	Theory (hours)	Practice (hours)	Student's Tasks
1	Chapter 1: Properties of water Density Surface phenomena Viscosity Dielectric constant	3	0	Required reading before class attending: Document [1] from pages of 3-14
2	Chapter 2: Hydrology Evaporation	3	0	Required reading before class attending:

	Water cycle Water flow and measurement Water loss in aquaculture ponds Stratification Eutrophication			Document [1] from page 17 to 18; pages of 22 to 38.
3~4	Chapter 3: Physical components Color Light and transparency Turbidity and solids Conductivity Ion composition in freshwater and seawater Temperature Salinity	6	0	Required reading before class attending: Document [1] from pages of 71-74; 102-111; Document [2] from page 88-94; Document [3] at pages of: 6, 8, 9.
5~9	Chapter 4: Chemical components pH and CO ₂ Alkalinity and hardness Dissolved oxygen (DO) Redox potential (RP) Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) Nitrogen (NH ₃ , NH ₄ ⁺ , NO ₂ ⁻ , NO ₃ ⁻) Phosphorus (P) Sulfur (S) Trace elements	15	0	Required reading before class attending: Document [1] at pages of 81, 132, 133; from 153-178; 179-186; 223-307 Document [2] from page 100-152; Document [3] from page 7-17.
10	Chapter 5: Biological components Microscopy (bacteria and fungi) Plants (algae, mosses, macrophytes) Invertebrates Vertebrate	3	0	Required reading before class attending: Document [1] from page 189-220; Document [2] from pages of 8-75; pages of 394-423; page of 461; Document [3] at a page of 8.
11~15	Chapter 6: Water quality management	15	0	Required reading before class attending:

	Water quality criteria for aquaculture ponds Fertilization Liming Aeration Biological treatments Chemical treatments			Document [1] from page 343-345; Document [2] from page 78-343; 498-531 Document [3] from pages 2-17; and pages of 23-33.
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**ON BEHALF OF RECTOR
DEAN OF COLLEGE**



Vũ Ngọc Út

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HEAD OF DEPARTMENT



Huỳnh Trường Giang