

COURSE OUTLINE DETAILS

1. Course: Limnology (Ao hồ học)

- **Code number:** AQ209

- **Credits:** 3

- **Hours:** 30 theory hours, 30 practice hours, 60 self-study hours

2. Management Unit:

- **Department:** Applied Hydrobiology

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

3. Requisites:

- **Prerequisites:** No

- **Corequisites:** No

4. Course objectives:

Objectives	Descriptions	Program Outcomes
4.1	To provide students a solid foundation of concepts to understand the complexity and dynamics of freshwater ecosystems including lakes and ponds in order to manipulate in a way to manage well the ecosystems.	2.1.2.a 2.1.2.b
4.2	To train students analyze and identify the aquatic organisms living in lake/pond ecosystems	2.2.1.a
4.3	To develop critical thinking skills, confidence for students (through in-class group discussions, presentations, and laboratory exercises)	2.2.2
4.4	To raise student's awareness on self-study and long life study attitude	2.3

5. Course learning outcomes:

COs	Descriptions	Objectives	POs
	Knowledge		
CO1	Describe the physical, chemical, biological and ecological characteristics and their dynamics in lakes and ponds	4.1	2.1.2.a
CO2	Explain the ecological processes of interaction and relationships between biotic and abiotic factors in lake and ponds	4.1	2.1.2.a
CO3	Characterize the common aquatic groups in lakes and ponds and freshwater ecosystems	4.1	2.1.2. b
	Skills		

COs	Descriptions	Objectives	POs
	Knowledge		
CO4	Collect and identify plankton and some water parameters in freshwater ecosystems	4.2	2.2.1.a
CO5	Develop ability of presentation, discussion and team working	4.3	2.2.2
	Attitudes/Autonomy/Responsibilities		
CO6	Display self-responsibility, assignment commitment and attitude of long-life study	4.4	2.3

6. Brief description of the course:

The course will provide students knowledge on chemical, physical, geological, biological, and ecological processes that influence the structure and function of aquatic communities; common aquatic plants, animals found in the ecosystems; the ecological relations among organisms in the ecosystems.

7. Course structure:

7.1. Theory:

	Content	Hours	COs
Chapter 1.	Introduction on limnology	3	
1.1.	Definitions of limnology		CO1, CO2, CO6
1.2.	Importance of limnology study		
1.3.	Approaches in limnology study		
1.4.	History of limnology study		
1.5.	Formation of lakes		
Chapter 2.	Characteristics of water	3	CO1, CO2, CO6
2.1.	Structure		
2.2.	Solubility		
2.3.	Salinity of water		
2.4.	Buffer system		
2.5.	Viscosity		
2.6.	Lake wave and seich		
Chapter 3.	Water physical characteristics	6	CO1, CO2, CO6
3.1.	Light and its effects on organisms		
3.2.	Heat and water stratification		
3.3.	Lake mixing patterns		
3.4.	Oxygen cycle		
3.5.	Carb dioxide cycle		

Chapter 4.	Water quality in ponds	3	CO1, CO2, CO5
4.1.	Physical characters		
4.2.	Chemical characters		
4.3.	Water quality management		
Chapter 5.	Nutrients	3	CO1, CO2, CO5
5.1.	Resource limitation		
5.2.	Phosphorus cycle		
5.3.	Nitrogen cycle		
5.4.	Ecological Stoichiometry		
Chapter 6.	Biotic profile of lakes and ponds	6	CO3, CO4, CO5
6.1.	Biological diversity of lakes and ponds		
6.2.	Aquatic invertebrates (protozoa, rotifers, cladoceran, copepods...)		
6.3.	Aquatic vertebrates (fish, birds, reptiles...)		
6.4.	Macrophytes		
6.5.	Importance of aquatic organisms in lakes and ponds		
Chapter 7.	Population dynamics	3	CO3, CO4, CO5
7.1.	Phytoplankton		
7.2.	Zooplankton		
7.3.	Loss and gain		
Chapter 8.	Ecological relationships	3	CO1, CO2, CO3, CO4, CO5
8.1.	Competition		
8.2.	Predation		

7.2. Practice

	Content	Hours	COs
Unit 1.	Preparation of instruments	5	CO1, CO2, CO4
1.1.	Secchi disk design		
1.2.	Experimental equipment preparation		
Unit 2.	Determination of chlorophyll-a in different fertilization regimes	5	CO1, CO2, CO4, CO5, CO6

2.1.	Experiment design (Fertilizer (NPK) supplied at 1, 2, 3 and 4 g/m ³ (in 20 L buckets)		
2.2.	Sampling and monitor temperature, pH, DO, EC and TDS		
2.3.	Analyzing chlorophyll-a		
2.4.	Results presentation		
Unit 3.	Determination of water quality parameter in ponds	5	CO1, CO2, CO4, CO5, CO6
3.1.	Measurement and analysis of temperature and pH		
3.2.	Measurement and analysis of transparency		
3.3.	Measurement and analysis of DO		
Unit 4.	Identification of phytoplankton	5	CO3 CO4, CO5, CO6
4.1.	Field sampling (in ponds)		
4.2.	Qualitative and quantitative analysis		
4.3.	Results presentation		
Unit 5.	Identification of zooplankton	5	CO3, CO4, CO5, CO6
5.1.	Field sampling (in ponds)		
5.2.	Qualitative and quantitative analysis		
5.3.	Results presentation		
Unit 6.	Identification of zoobenthos	5	CO3, CO4, CO5, CO6
6.1.	Field sampling (in ponds)		
6.2.	Qualitative and quantitative analysis		
6.3.	Results presentation		

8. Teaching methods:

- Class lectures
- Group discussion, presentation
- Practical exercises

9. Duties of student:

Students have to do the following duties:

- Attending at least 80% of theoretical session
- Attending 100% hours of practical and reporting results
- Participating in group discussions and presentation
- Taking quizzes
- Taking final test

10. Assessment of course learning outcomes:

10.1. Assessment

No.	Point components	Rules and Requirements	Weights	COs
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1	Attendance	Number of attendance hour/total class hours	5%	CO6
2	Work assignment	Seminar/presentation Participation confirmed by team	15%	CO5, CO6
3	Lab work	100% participating in lab work	15%	CO4, CO5, CO6
4	Mid term exam	Multiple choice exam. Not absent	15%	CO1, CO2, CO3, CO4
5	Final exam	Multiple choice combined with written exam Attending at least 80% theoretical hours and 100% practical hour of lab work Compulsory exam	50%	CO1, CO2, CO3, CO4

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] Dodson, S. 2005. Introduction to limnology. McGraw Hill Companies. 400pp.	TS 003802
[2] Claude E.Boyd, 1998. Water quality for Pond Aquaculture. Research and Development Series No.43, Auburn University.	TS.003885
[3] Pechenik, J. A. (2000). Biology of the invertebrate. The McGraw- Hill Companies, Inc.	TS.002074

12. Self-study Guide:

Week	Content	Theory (hours)	Practice (hours)	Student's Tasks
1	Chapter 1: Introduction on limnology 1.1. Definitions of limnology 1.2. Importance of limnology study	6	3	Students should read in advance: + Reference [1]: from p3-23

	1.3. Approaches in limnology study 1.4. History of limnology study 1.5. Formation of lakes			
2	Chapter 2: Characteristics of water 2.1. Structure 2.2. Solubility 2.3. Salinity of water and buffer system 2.4. Viscosity 2.5. Wave and seich	6	3	Students should read in advance: + Reference [1]: pp. 29-38, 50-56; + Reference [2]: pp. 5-28
	Chapter 3: Water physical characteristics 3.1. Light and its effects on organisms 3.2. Heat and water stratification 3.3. Lake mixing patterns 3.4. Oxygen and carbon dioxide cycle	12	6	Students should read in advance: + Reference [1]: pp. 40-47, 231-239; + Reference [2]: pp.5-28
	Chapter 4: Water quality in ponds 4.1. Physical characters 4.2. Chemical characters 4.3. Water quality management	6	3	Students should read in advance: + Reference [2]: pp. 5-40;
	Chapter 5: Nutrients 5.1. Resource limitation 5.2. Phosphorus cycle 5.3. Nitrogen cycle 5.4. Ecological Stoichiometry	6	3	Students should read in advance: + Reference [1]: pp. 65-80;

Chapter 6: Biotic profile of lakes and ponds 6.1. Biological diversity of lakes and ponds 6.2. Aquatic invertebrates (protozoa, rotifers, cladocerans, copepods...) 6.3. Aquatic vertebrates (fish, birds, reptiles...) 6.4. Macrophytes 6.5. Importance of aquatic organisms in lakes and ponds	12	6	Students should read in advance: + Reference [1]: pp. 239-251, 85-157; + Reference [3]: pp.157-163; 263-275; 357-364;
Chapter 7: Population dynamics 7.1. Phytoplankton 7.2. Zooplankton 7.3. Loss and gain	6	3	Students should read in advance: + Reference [1]: pp. 85-175
Chapter 8: Ecological Relationships 8.1. Competition 8.2. Predation	6	3	Students should read in advance: + Reference [1]: pp. 161-179;

ON BEHALF OF RECTOR
DEAN OF COLLEGE


 Vũ Ngọc Út

Can Tho, 30/.../8/2022
HEAD OF DEPARTMENT


 Huỳnh Trường Giang