

COURSE OUTLINE DETAILS

1. Course: Aquatic Biomonitoring (Quan trắc sinh học môi trường nước)

- **Code number:** AQ229

- **Credits:** 2

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

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 basic knowledge and concepts to understand the principles of using aquatic organisms to apply in monitoring water quality in aquatic ecosystems	2.1.3.a
4.2	To train students to identify and apply different kinds of aquatic organisms in bio-monitoring an ecosystem.	2.2.1.a
4.3	To develop critical thinking skills, confidence for students (through in-class group discussions, presentations)	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 ecological factors affecting on aquatic organisms and their adaptation	4.1	2.1.3.a
CO2	Characterize approaches and methods used for bio-indicators and bio-monitoring	4.1	2.1.3.a
CO3	Explain how and why common aquatic organisms are used as bio-indicators for bio-monitoring	4.1	2.1.3.a
	Skills		
CO4	Determine proper approaches and methods for bio-monitoring	4.2	2.2.1.a
CO5	Identify and utilize aquatic organisms as bio-indicators for bio-monitoring	4.2	2.2.1.a

COs	Descriptions	Objectives	POs
CO6	Develop ability of presentation, discussion and team working	4.3	2.2.2
	Attitudes/Autonomy/Responsibilities		
CO7	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 (i) status of bio-monitoring application in the world as well as in Vietnam; (ii) approaches used for bio-indicator identification; (iii) methods used to evaluate biodiversity and bio-indicators; (iv) aquatic organisms used as bio-indicators for bio-monitoring; (v) application of bio-monitoring in assessing a water body or an ecosystem.

7. Course structure:

	Content	Hours	COs
Chapter 1.	Concepts on bio-indication and approaches used in bio-monitoring	4	
1.1.	Bio-indication and bio-indicators		CO1, CO2, CO4, CO6
1.2.	Bio-monitoring		
1.3.	Approaches used in bio-indicator selection		
1.4.	Status of development of bio-monitoring		
Chapter 2.	Environmental interactions, influence factors and adaptations of aquatic organisms	4	CO1, CO2, CO6
2.1.	Ecological factors and limitations		
2.2.	Effects of abiotic factors on aquatic organisms		
2.3.	Adaptations of aquatic organisms		
Chapter 3.	Approaches and methods used in bio-monitoring	4	CO1, CO2, CO4, CO6
3.1.	Single species		
3.2.	Multiple species		
3.3.	Bio-indices		
Chapter 4.	Common aquatic organisms used for bio-monitoring	6	CO1, CO2, CO3, CO5, CO6
4.1.	Planktons		
4.2.	Macroinvertebrates		
4.3.	Fish		
4.4.	Benthic algae		
Chapter 5.	Sampling methods	2	CO1, CO2, CO3, CO5, CO6

5.1.	Phytoplankton		
5.2.	Zooplankton		
5.3.	Aquatic insects		
5.4.	Benthic invertebrates		
5.5.	benthic algae		
Chapter 6.	Application of aquatic bio-monitoring	5	CO3, CO4, CO5, CO6
6.1.	Bio-indication systems for water quality assessment		
6.2.	Diversity indices		
6.3.	Eutrophication bio-indicators		
6.4.	Bio-monitoring in Vietnam		
Chapter 7.	Ecological assessment of aquatic resources	5	CO3, CO4, CO5, CO6
7.1.	Foundation for effective ecological assessments		
7.2.	Designing data collection for ecological assessments		
7.3.	Interpreting results of ecological assessments		
7.4.	Valuing ecological resources		
7.5.	Translating ecological science		

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
1	Attendance	Number of attendance hour/total class hours	5%	CO7
2	Work assignment	Seminar/presentation Participation confirmed by team	30%	CO6, CO7
4	Mid term exam	Multiple choice exam Not absent	15%	CO1, CO2, CO3, CO4, CO5
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, CO5

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:

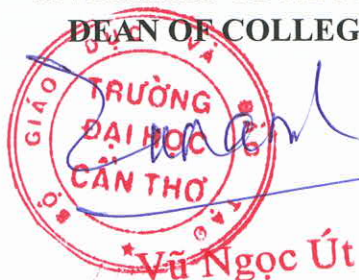
Learning materials information	Barcode number
[1] Rosenberg, D.M and resh, V.H. 1993. Freshwater biomonitoring and benthic macroinvertebrates. Chapman & Hall Inc., 460pp.	TS000894; 577.6 F 885
[2] Pechenik, J. A. (2000). Biology of the invertebrate. The McGraw- Hill Companies, Inc.	TS.002074
[3] Barbour, M.T., Norton, S.B., Preston, H. R., and Thornton, K.W. 2000. Ecological assessment of aquatic resources: Linking science to decision making. Proceedings from the workshop on Ecological assessment of aquatic resources: application, implementation and communication, 16-21 September 2000, Pellston, Michigan, USA.	TS005658
[4] Le Van Khoa, Nguyen Xuan Quynh, Nguyen Quoc Viet. 2007. Environmental bio-indication. Vietnam Education Publishing, 279 pp. (In Vietnamese)	MOL079515

12. Self-study Guide:

Week	Content	Theor y (hours)	Practice (hours)	Student's Tasks
1	Chapter 1: Concepts on bio-indication and approaches used in bio-monitoring 1.1. Bio-indication and bio-indicators 1.2. Bio-monitoring 1.3. Approaches used in bio-indicator selection 1.4. Status of development of bio-monitoring	6	3	Students should read in advance: + Reference [1]: from p3-23
2	Chapter 2: Environmental interactions, influence factors and adaptations of aquatic organisms 2.1. Ecological factors and limitations 2.2. Effects of abiotic factors on aquatic organisms 2.3. Adaptations of aquatic organisms	6	3	Students should read in advance: + Reference [1]: pp. 29-38, 50-56; + Reference [2]: pp. 5-28
	Chapter 3: Approaches and methods used in bio-monitoring 3.1. Single species 3.2. Multiple species 3.3. Bio-indices	12	6	Students should read in advance: + Reference [1]: pp. 40-47, 231-239; + Reference [2]: pp.5-28
	Chapter 4: Common aquatic organisms used for bio-monitoring 4.1. Planktons 4.2. Macroinvertebrates 4.3. Fish 4.4. Benthic algae	6	3	Students should read in advance: + Reference [2]: pp. 5-40;
	Chapter 5: Sampling methods	6	3	Students should read in advance: + Reference [1]: pp. 65-80;

5.1. Phytoplankton 5.2. Zooplankton 5.3. Aquatic insects 5.4. Benthic invertebrates 5.5. Benthic algae			
Chapter 6: Application of aquatic bio-monitoring 6.1. Bio-indication systems for water quality assessment 6.2. Diversity indices 6.3. Eutrophication bio-indicators 6.4. Bio-monitoring in Vietnam	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: Ecological assessment of aquatic resources 7.1. Foundation for effective ecological assessments 7.2. Designing data collection for ecological assessments 7.3. Interpreting results of ecological assessments 7.4. Valuing ecological resources 7.5. Translating ecological science	6	3	Students should read in advance: + Reference [1]: pp. 85-175

ON BEHALF OF RECTOR
DEAN OF COLLEGE


Vũ Ngọc Út

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


Huỳnh Trường Giang