

1. INFORMATION OF COURSE AND LECTURER

1.1. Course name and code: **Bio-monitoring in the aquatic environments**

1.2. Course specification: 2 Cred. (T: 30; A: 0; P: 0)

1.3. Prerequisites courses: None

1.4. Responsible Department: Applied Hydrobiology

1.5. Information of lecturer:

Name: Vu Ngoc Ut (College of Aquaculture and Fisheries, CTU)

Email: vnut@ctu.edu.vn

Co-teaching lecturer:

Name : Truong Quoc Phu (College of Aquaculture and Fisheries, CTU)

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2. 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.

3. COURSE EXPECTED LEARNING OUTCOMES

When successfully completing the course, the students will be able to analyze, evaluate and apply issued related to biomonitoring:

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

4. COURSE CONTENTS

Chapters	Hours (T/A/P)
<p>Chapter 1: INTRODUCTION TO BIOMONITORING</p> <p><i>This chapter will introduce information on concepts and definitions of biomonitoring, bioindicators; biomonitoring history and development; approaches used in biomonitoring to assess water quality</i></p> <p>1.1. Concepts on bioindicators</p> <p>1.2. History of biomonitoring research and development</p> <p>1.3. Role of biomonitoring in pollution assessment</p> <p>1.4. Application of biomonitoring in the world and Vietnam</p> <p>1.5. Sampling methodologies in biomonitoring</p> <p><i>In order to understand well this chapter, students should read references of [1], [2]</i></p>	<p>5/0/5</p>

<p>Chapter 2: BIO-INDICATOR ORGANISMS USED IN BIO-MONITORING</p> <p><i>This chapter will provide knowledge on bioindicator organisms used in biomonitoring, advantages and disadvantages of these groups in biomonitoring</i></p> <p>2.1. Algae/phytoplankton</p> <p>2.2. Zooplankton</p> <p>2.3. Macroinvertebrates</p> <p>2.4. Periphyton</p> <p>2.5. Fish</p> <p>2.6. Advantages and disadvantages of each group</p> <p><i>In order to understand well this chapter, students should read references of [2], [3],[4]</i></p>	5/0/5
<p>Chapter 3: BIO-INDICES</p> <p><i>This chapter will provide knowledge on bio-indices, their uses in assessing the water quality, advantages and disadvantages</i></p> <p>3.1. Status of development and use of bio-indices</p> <p>3.1.1. In the world</p> <p>3.1.2. In Vietnam</p> <p>3.2. Bio-indices</p> <p>3.2.1. Diversity index</p> <p>3.2.2. Saprobic index</p> <p>3.2.3. Trophic index</p> <p>3.2.4. Bio integrity index</p> <p>3.2.5. Other indices</p> <p><i>In order to understand well this chapter, students should read references of [4], [6].</i></p>	5/0/5
<p>Chapter 4: BIOMONITORING USING MACRO-INVERTEBRATES</p> <p><i>This chapter will provide information and methods for rapid assessment of water quality using macroinvertebrates</i></p> <p>4.1. Elements of rapid assessment approaches</p> <p>4.2. Rapid assessment measures</p> <p>4.3. Rapid assessment protocols in current use</p> <p>4.4. Determining the accuracy of rapid bioassessment measures</p> <p><i>In order to understand well this chapter, students should read references of [3], [4].</i></p>	3/0/5

<p>Chapter 5: BIOMONITORING OF THE LOWER MEKONG RIVER AND TRIBUTARIES</p> <p><i>This chapter will provide information on biomonitoring methods in lower Mekong river for assessment of water quality and health of this ecosystem</i></p> <p>5.1. Sampling methodologies</p> <p>5.2. Bio-indices</p> <p>5.3. Results of the monitoring</p> <p><i>In order to understand well this chapter, students should read references of [7].</i></p>	<p>2/0/0</p>
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6. TEACHING METHODS AND ASSESSMENT

5.1 Teaching methods:

Lectures are given on class in combination with assignment which is given to groups of students with different given topics. Each group prepares for the presentation at the end of the theory.

5.2 Assessment methods:

- Midterm exam: 20%
- Seminar: 30%
- Final exam: 50%

6. READING REFERENCES

- [1] Knoben, R.A.E., Roos, C. and van Oirschot, M.C.M (1995). Biological assessment methods for watercourse. UN/ECE Task Force on Monitoring & Assessment. RIZA Report Nr. 95.066, 86pp.
- [2] Li Li, Binghui Zheng and Lusan Liu (2010). Biomonitoring and bioindicators used for river ecosystems: Definitions, Approaches and Trends. Procedia Environmental Sciences 2 (2010) 1510–1524.
- [3] Resh, H.V and Jackson, J,K (1993). Rapid assessment approaches to biomonitoring using benthic macroinvertebrates. In: Freshwater biomonitoring and benthic macroinvertebrates (Edited by Rosenberg, D.M and Resh, H.V), Chapman & Hall, Inc, 460pp.
- [4] Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. (1999). Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.
- [5] Subramanian, K.A. and Sivaramakrishnan (2007). Aquatic insect for biomonitoring freshwater ecosystem- A methodology manual. Asoka Trust for research in Ecology and Environment, Bangalore, India.
- [6] Le Van Khoa, Nguyen Xuan Quynh, Nguyen Quoc Viet (2007). Environmental bio-indicators. Education publing house, 279pp.
- [7] MRC (2010). Biomonitoring Methods for the Lower Mekong Basin. Mekong River Commission, Vientiane, 81 pp.

Date: June 23, 2015

Lecturer: