

CENTER FOR INTERNATIONAL PROGRAMS

Course name: Freshwater Ecology

Course code: ENV 3170

Total Contact Hours: 60

Credits: 4

Prerequisite: General Biology

COURSE DESCRIPTION

Water is a vital resource for human beings, but it is a limited resource that have been degraded and the demand for this resource is growing. Freshwater ecology or limnology is a course to help us understand the physical, chemical and biological properties of inland aquatic environments (wetlands, lakes, rivers, mangroves, and reservoirs). It aims to give emphasis to the problems and conservation efforts for water resources, for that we will learn methods for monitoring aquatic environments with field trips and laboratory work.

Objectives

1. Learn the main chemical, biochemical and physical process that occur in the aquatic environments
2. Learn the characteristics of the main tropical freshwater ecosystems
3. Learn the main adaptations of the organisms in the aquatic environment
4. Learn about the interactions between organisms in aquatic environments
5. Learn methods for monitoring aquatic environments
6. Recognize the main problems affecting the aquatic environments
7. Recognize the main solutions to increase water quality

Contents

Unit 1. Introduction to the aquatic environment

- 1.1 Introduction
- 1.2 Definition of limnology
- 1.3 Ecosystems included in the course
- 1.4 Main and important definitions
- 1.5 Importance of the aquatic environment

Unit 2. Physical and chemical water properties

- 2.1 Color.
- 2.2 Temperature.
- 2.3 Sedimentation.
- 2.4 Water density and viscosity.
- 2.5 Surface tension .
- 2.6 The water molecule.
- 2.7 Oxygen and CO₂ in the water
- 2.8 pH
- 2.9 Methods to measure the physical and chemical water properties

Unit 3. Water as an ecosystem

- 3.1 Photosynthesis.

- 3.2 Respiration
- 3.3 Autotrophs.
- 3.4 Nutrients .
- 3.5 Heterotrophs.
- 3.6 Symbiosis .
- 3.7 Ecological succession.
- 3.8 Nitrogen cycle
- 3.9 Definitions of main communities in the aquatic environments

Unit 4. Wetlands

- 4.1 Definition
- 4.2 Characteristics
- 4.3 Ramsar convention
- 4.4 Threats
- 4.5 Conservation and restoration

Unit 5. Lakes

- 5.1 Classification of lakes according with the origin
- 5.2 Lakes zones

- 5.3 Lake's communities
- 5.4 Adaptation of organisms to lentic environments
- 5.5 Parameter to study lakes
- 5.6 Thermal stratification
- 5.7 Productivity
- 5.8 Eutrophication

6.8 Aquatic macroinvertebrates in streams

Unit 6. Rivers

- 6.1 Rivers's origin
- 6.2 Currents classification
- 6.3 Movement .
- 6.4 Parameter to study lakes
- 6.5 Season changins.
- 6.6 River's communities.
- 6.7 Adaptation of organisms to lotic environments

Unit 7. Mangroves

- 7.1 Definition
- 7.2 Classification
- 7.3 Salinity
- 7.4 Productivity
- 7.5 Communities.
- 7.6 Importance

Unit 8. Reservoirs

- 8.1 Caracteristicas
- 8.2 Classifications.
- 8.3 Importance .

Attendance

Student's attendance to every class is mandatory. If a student gets sick or has some other important problem, he/she has to bring a document justifying their absence.

After 2 **justified** absences, students will fail the course.

If you miss more than one day of class in a given month, YOU WILL NOT RECEIVE CREDIT for that particular course. Professors have the right to expel a student from the classroom should he / she:

- 1) be improperly dressed
- 2) be under the influence of alcohol or even smell like alcohol
- 3) Behave in a disrespectful way.

If you tend to be late for class, you will lose 25% of your total grade.

Methodology

The classes are present with plenty of visual images and examples in power point presentations. Some classes are complemented with movies as well. Students should participate in class reading discussions in order to have a better comprehension of the theory. Laboratory session and field trips are part of the class.

Evaluation system

Theory

Individual presentation	15%
Class Participation (discussions, homeworks)	15%
Midterm Tests	15%
Final Test	15%

Laboratory

Lab reports	15%
Group project	15%
Field trip participation	10%

Individual presentation

In the chronogram students will find the assignment within the due date. Students should send the assignments by email

Students (1, 2 or 3) will choose a topic from the list (or propose a new one) in order to present an oral Bibliographic Revision.

This presentation should include new, scientific information about the topic, also studies and data

Requirements:

- The topic should be specific
- Students should select the topic the second day of classes.
- The topic should be explain in general way first, then more specific and later present some study cases
- Students have to do a powerpoint or a presentation in other format
- Oral presentations should not exceed 15 minutes of exposition plus 5 minutes for questions (20 minutes total).
- Students have to create a website beside the presentation
- Each student or group will send the website of their topic to all classmates and the instructor. The website should include the main information, extra information, videos, data, pictures, link to related websites and references
- At least 5 scientific references should be used and cited (internet sources are not considered scientific references) but they may be included within this list as well
- Both the website and the presentation should have references.

- The recommended order of the presentation is
 1. Title and participants
 2. Objectives
 3. Introduction
 4. Specific information about the topic
 5. Study cases
 6. Conclusions
 7. References

- Evaluation of the assignment:
 1. Content: 20 pts (New, relevant, accurate and with data)
 2. Fluency and organization: 20 pts (keep an order, not reading everything, good use of time)
 3. Website: 20 pts (well organized, easy to navigate, looks clean, links, videos, images, references)
 4. References: 20 pts (APA format, at least 5 scientific references from journals)
 5. Presentation: 20 pts (Not a lot of text in the slides, images, or infographics, videos if they are necessary, fonts big enough, good contrast. Look clean)

Class Participation and homeworks

Participation will be evaluated according to the contributions of students to the lesson, showing respect to the classmates and professor..

Students should be prepared for class discussion on assign readings or assign topics.

The use of cell phones, tablets or laptops is not allowed, except specific class activities.

Different small homework will be assign during the course to develop in groups or individually. Students will have at least one week to present the homework.

Exams:

The exams are not cumulative. These contain multiple choice questions and short answer questions.

Students will have 90 minutes to complete the exam

If a student misses an exam must present a medical excuse, and the new test will have essay questions.

Check the distribution of lessons for the exam dates

Lab reports

Students will receive a lab manual during the first week of class. This manual contains the lab practices.

Each week we will have a lab session, students must read the lab before class and have to answer the question in the lab manual.

Group Research Assignment

During the second field trip students have to do a research project with aquatic environments.

Requirements:

- Groups of 3 or 4 students
- Students should propose a field research, following the scientific method
- A report with scientific paper format should be send by email to the professor (check the due date in the chronogram)

- Evaluation of the group research Project

- Project approach: 20 pts
- Field work: 20 pts
- Format: 10 pts
- Introduction: 10 pts
- Methodology: 10 pts
- Results: 10 pts
- Discussion: 10 pts
- References: 10 pts (APA format, at least 5 scientific references from journals)

Field trips

- Field trips are not excursions
- Participants must be fully enrolled in this course and no guests are allowed.
- Students must be on time for all fieldtrip activities including departure from places and pre-schedule meal times.
- Although many places of the country have allowed us to find suitable accommodations many of the volunteer work stations or research areas require rustic accommodations.
- This is an environmental science course. Field work may include long walks, longboat rides and snorkeling activities
- Water shoes, Velcro sandals or tennis shoes that you can wet, are necessary for intertidal zone exploration.
- Rain jackets are important in the field trips
- Field trip location depends on weather conditions

Bibliography

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- McCafferty, P., Provonsha, A. Aquatic Entomology. Bartlett Publishing. Boston. 448 p
- Merrit, R., Cummins, K. 1996. An introduction to the Aquatic Insects of North America. Kendall Hunt Publishing. Iowa. 862 p.
- Moyle, P.B. & J.J. Cech. 2003. Fishes: An Introduction to Ichthyology. 5th Edition. Benjamin Cummings. 672p.
- Roldán. G. Fundamentos de Limnología Neotropical. Editorial Universidad de Antioquia. Colombia. 529 p
- Ruppert, E.E. & R.D. Barnes. 1996. Zoología de los Invertebrados. 6^a Ed. Interamericana S.A. Mexico. 1114p.
- Rutzler, K. & I.C. Feller. 1996. Caribbean Mangrove Swamps. Scientific American. March, 1996: 70-75
- Wetzel, R.G. 2001. Limnology. Lake and River Ecosystems. 3 ed. Academic Press. 1006 p
- Note: Scientific papers, news and book chapter can be assign during the course

Chronogram

Week	Topic	Lab
1	Introduction to the aquatic environment	Scientific method and scientific papers
2	Physical and chemical water properties	Thermocline, Halocline
3	Physical and chemical water properties	Chemical characteristics of water
4	Water as an ecosystem	Water quality index
5	Wetlands	Aquatic plants Oxygen intake
6	Lakes	Plankton identification
7	Midterm	Introduction to aquatic insects
8	Rivers	Aquatic insects families I
9	Mangroves	Aquatic insects families II
10	Reservoirs	Field trip samples identification
11	Presentations	Field trip samples identification
12	Final	