

1. Module XIV: Impact and Application I (Environment)

1.1. Module Objectives

On completion of this module, the students will:

- Describe and list of microorganisms are found in the air, terrestrial and aquatic environments, and understand in broad terms the mechanisms microorganisms use to obtain energy for growth and reproduction and how these biochemical processes are linked with geochemical cycling of the elements.
- Describe and define character of bacteria, fungi, protozoa, algae and viruses are and describe roles they play in the geochemical cycling of elements.
- They will be aware of the geochemically and environmentally significant processes that are contributed to by the activities of microorganisms and the environmental factors that control and limit microbial activities. The geochemical roles and importance of heterotrophs and autotrophs will be understood.

1.2. Module Data

Person in charge	Dr. Sri Harjati Suhardi
Credits	3
Course	BM3103-Environmental Microbiology
Course Examination	Written Test

1.2.1. Sub-module I: Environmental Microbiology

Lecturer	Dr. Sri Harjati Suhardi
Semester	3
Type of submodule / course	Compulsory
Credits	3
Workload	3 hours lectures, 3 hours structured activities, 3 hours individual study, 16 weeks per semester, and total 144 hours a semester
Workload Detail	textbook reading assignment, group discussion, presentation, paper review
Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Quizzes, Assignments
Language	Bahasa Indonesia
Course Target / Outcome	Knowledge

	<p>Students will be able to :</p> <ul style="list-style-type: none"> - Define the general concepts of microbiology, such as growth, metabolism, genetics, and microbial structure and function - Define specific environmental microbiology topics such as microbial roles in wastewater treatment, disinfection, waterborne microbial pathogens, indicator organisms, and pollution control <p>Scientific</p> <p>Students will be able to:</p> <ul style="list-style-type: none"> - describe the diversity of microorganism in environment, the character and role of terrestrial (both in and below soil surface), air, and aquatic microorganism. - define and the characters, role , and control of microorganism in extreme condition (pH, temperature, humidity, and salinity) - identify the aspects of microorganisms exploration by explore the common problems. - define and describe the concept of the application of microorganism in various organic substances contamination in environment - classify the microorganism based on their abilities as environmental quality indicator, and prepare the development of its technology - define the role of microorganisms in waste water treatment and the prospect of development of new technology with “new” microorganism approach - Students will be able to define the safety in exploring, working, and developing microorganisms from environment. - formulate the solution of problems in their surroundings by using the application of bioprocesses. - apply the ability of microorganisms as agent in the bio-based technology development
Teaching methods	Interactive Lecture and Interactive Laboratory Practices
Contents (SAP)	
1	Environment microorganisms
2	Terrestrial microorganisms
3	Aeromicrobiology
4	Aquatic microorganisms
5	Extreme-condition microorganisms
6	Basic technique used in environment microbiology

7	Mid-Term Test
8	Biofilm
9	Microbial communication, activity, and interaction in environment
10	Global change and microbial infectious diseases
11	Microorganisms and teratements of pollutant
12	Environment quality indicator
13	Microorganisms in wste water treatment
14	Risk assessment
15	
16	Final Test
Literature / Sources	<ul style="list-style-type: none"> • Mitchell, R. and Gu, J., D. (2010) <i>Enviromental Microbiology</i>. Wiley – Blackwell. USA • International Journals of: Applied and Environmental Microbiology, Environmental Science and Technology, Bioresource Technology, Environment International, Marine & Pollution Bulletin, Marine Environmental Research, International Biodeterioration & Biodegradation