

## Module XVI: Microbial System IIA

### 1.1. Module Objectives

On completion of this module, the students will:

- Able to apply basic technique of microbiology, biochemical, and molecular related to microbial identification and classification
- Able to describe microbial evolution including virus and its relation to microbial biodiversity, taxonomy, and classification
- Able to describe the relationship between microbial diversity and its interaction
- “Have open mind and respectful to microbia diversity “
- Systematic thinking

### 1.2. Module Data

Person in charge	Azzani Fibriani, PhD
Credits	14
Course	BM 3103 Microbial Biosystematic
	BM 3104 Introduction of bioinformatic
	BM 3105 Virology
	KI 3163 Introduction to Enzymology
Modules Examination	Written Test

#### 1.2.1. Sub-module I: Microbial biosystematic

Lecturer	Dr. Eng. Isty Adhitya Purwasena; Dr. Intan Taufik
Semester	5
Type of submodule / course	Compulsory
Credits	3(1)
Workload – Class Lecture	2 hours lectures, 3 hours laboratory, 2 hours structured activities, 2 hours individual study, 16 weeks per semester, and total 144 hours a semester
Workload Detail	Paper reading assignment, group discussion, presentation, paper review, small exhibition
Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of examination	Written test
Language	Bahasa Indonesia
Course Target / Outcome	A. <u>Conceptual Knowledge and Competence:</u> <ul style="list-style-type: none"><li>- Identify and understand the concept of classification of microorganisms</li><li>- Distinguish between phenotypic characters and genotypes of microorganisms</li><li>- Identify emerging issue related to molecular techniques and the usage of gene probe to microbial identification</li><li>- Define the conceptual theory of microbial identification and classification</li></ul>

	<ul style="list-style-type: none"> <li>- Understand the classification, evolutionary kinship and identification of key groups of microorganisms and their economic, medical and environmental interests</li> <li>- Understand the various methods used to detect enumeration of microorganisms</li> </ul> <p>A. <u>Laboratory Skills:</u></p> <ul style="list-style-type: none"> <li>- classify and identify microorganisms using standard microbiological laboratory equipment</li> <li>- Identify microorganisms using molecular techniques and probes</li> <li>- Implement appropriate safety procedures in the laboratory</li> </ul> <p>B. <u>Scientific Skills:</u></p> <ul style="list-style-type: none"> <li>- Write scientific articles and present scientific articles about biosystematic microorganisms</li> <li>- Use standard laboratory equipment in microbiology and molecular biology related to biosystematic microorganisms</li> <li>- Demonstrate working and communication attitude effectively in team.</li> </ul> <p>C. <u>Social Skills:</u></p> <ul style="list-style-type: none"> <li>- Able to work in teams and communicate well in groups.</li> </ul>
Teaching methods	Interactive Teaching
Contents (SAP)	
1	Introduction to microbial biosystematic and classification: background, concept, and development.
2	Basic knowledge and determination method in microbial biosystematic: Evolution
3	Methods in microbial biosystematic
4	Genetic aspect in microbial biosystematic determination
5	Principal of taxonomy, classification approach, classification system, Nomenclature system, Taksa
6	level, phylogentic tree
7	Mid-Term Test
8	Principal of taxonomy, classification approach, classification system, Nomenclature system, Taksa
9	level, phylogentic tree
10	Microbial Classification
11	Differentiation of Gram in Bacteria

	12	Speciation
	13	Cell membranes and cell walls in Bacteria and Archaea.
	14	Microbial identification and symbiotic relationship
	15	Microbial identification
	16	Final Test
Literature / Sources		Bergey's Manual of Systematic Bacteriology. 2005. Springer
		Martinko, J.M. and Madigan, M.T., 2015. Brock biology of microorganismss. ed: Englewood Cliffs, NJ: Prentice Hall
Other specialties		

### 1.2.1. Sub-module II: Introduction to Bioinformatics

Lecturer	Dr. Adi Pancoro
Semester	5
Type of submodule / course	Laboratory work
Credits	2 (1)
Workload	1 hours lectures, 3 hours laboratory, 1 hours structured activities, 1 hours individual study, 16 weeks per semester, and total 96 hours a semester
Workload Detail	Computation work, textbook reading assignment, group discussion, presentation, paper review
Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of examination	Written test and hands on practical test
Language	Bahasa Indonesia
Course Target / Outcome	<p>A. <u>Conceptual Knowledge and Competence:</u></p> <ul style="list-style-type: none"> <li>- Student able to Identify types of genetic information on microorganisms</li> <li>- Student familiar and be able to search and retrieve information from databases, analyze molecular data (DNA, RNA, and protein)</li> <li>- Compute and analyze microorganism genetic information data</li> <li>- Analyze the genetic information flow of microorganisms and their relationship with the response to the environment</li> </ul> <p>B. <u>Laboratory Skills:</u></p> <ul style="list-style-type: none"> <li>- Identify software and its application in processing genetic information of microorganisms</li> </ul>

	<p>C. <u>Scientific Skills:</u></p> <ul style="list-style-type: none"> <li>- Student be able to implement the bioinformatics analysis from microorganismss databases</li> <li>- Student be able to design the bioinformatics pipelines independently, how to interpret the results of their analysis, and write the report on it.</li> </ul> <p>D. <u>Social Skills:</u></p> <ul style="list-style-type: none"> <li>- Able to work together and communicate in teams</li> <li>- Having an understanding related to the development of bioinformatics on human benefit</li> </ul>
Teaching methods	Interactive Lecture and Interactive Computational Practices
Contents (SAP)	
	1 Introduction to Bioinformatics
	2 Database-Genebank : Intoduction to Genebank and Data Search in Genebank
	3 Database-Genebank : Retrieve DNA sequence and BLAST
	4 Data Analysis I : Database of nucleotide sequence and protein
	5 Data Analysis I : Single DNA sequence and protein
	6 Mid-Term Test
	7 Data Analysis II : Similarity of Sequences in Database
	8 Data Analysis II : Comparison of Two Sequences in Database
	9 Data Analysis II : Building multiple alignment sequencing
	10 Data Analysis II :Analysis of Multiple alignment sequencing
	11 Data Analysis III : 3D Protein structure
	12 Data Analysis III : Working with RNA
	13 Data Analysis III : Building a phylogenetic tree
	14 Aplication of Bioinformatics : Procaryote genome project
	15 Aplication of Bioinformatics: Eukaryote genome project
	16 Final Test
Literature / Sources	<p>Claveire, J-M and C.Notredame. 2003 or late edition. <i>Bioinformatics for Dummies</i>. Wiley Publishing, Inc</p> <p>Xiong J. 2006. <i>Essential Bionformatics</i>. Cambridge University Press</p>

	H. Christensen. <i>Introduction to Bioinformatics in Microbiology</i> . Springer Nature
	Lesk, Arthur M. <i>Introduction to Bioinformatics 4<sup>th</sup> Ed.</i> Oxford University Press

### 1.2.2. Sub-module III: Virology

Lecturer	Ernawati A.Giri-Rachman
Semester	5
Type of submodule / course	Compulsory
Credits	3
Workload – preparation	3 hours lectures, 3 hours structured activities, 3 hours individual study, 16 weeks per semester, and total 192 hours a semester
Workload Detail	Paper reading assignment, group discussion, presentation, paper review, small exhibition
Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of examination	Written test
Language	Bahasa Indonesia
Course Target / Outcome	<p>After attending this lecture, students are expected to be able to:</p> <p>A. <u>Conceptual Knowledge and Competence</u></p> <ul style="list-style-type: none"> <li>- Identify the structure and function of various types of viruses</li> <li>- Classify viruses based on their structure and function</li> <li>- Understand viral genetic information flow and response to the environment</li> <li>- Analyze the impact of viruses in life</li> </ul> <p>B. <u>Laboratory Skills:</u></p> <ul style="list-style-type: none"> <li>- Able to apply the methods and techniques of molecular microbiology that are appropriate in the extraction of genetic material, cultivation, and other analyzes on viruses</li> <li>- Able to apply work safety procedures suitable for molecular microbiology laboratories</li> </ul> <p>C. <u>Social Skills:</u></p> <ul style="list-style-type: none"> <li>- Able to work together and communicate in teams</li> </ul>
Teaching methods	Interactive Teaching
Contents (SAP)	
	1 Introduction of Virology
	2 Virus as biotechnology agent
	3 Viral type, characters, and structural forming

4	Viral transmission process (animal and plant cell)
5	Genetic characteristic and growth of virus
6	
7	Mid-Term Test
8	Classification and pathogenicity of virus
9	
10	
11	Bacteriophage : Types and infection mechanism.
12	Immune system against viral infection
13	Disease caused by virus.
14	Prevention methods of diseases caused by virus
15	Type of disease that caused by prion and its pathogenicity.
16	Final Test
Literature / Sources	
Other specialties	

### 1.2.3. Sub-module IV: Enzimology

Lecturer	Dr. I Made Puspa
Semester	5
Type of submodule / course	Compulsory
Credits	2
Workload – Class Lecture	2 hours lectures, 2 hours structured activities, 2 hours individual study, 16 weeks per semester, and total 96 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 examination	Written test
Language	Bahasa Indonesia
Course Target / Outcome	Students able to define and describe the role of enzyme as biocatalyze in metabolism process and its application in Industries
Teaching methods	Interactive Lecture and Interactive Computational Practices
Contents (SAP)	
1	General aspect of enzyme molecules
2	The advantage of enzyme reaction
3	Classification and identification method of enzyme
4	Classification and identification method of enzyme
5	Classification and identification method of enzyme
6	Mid-Term Test

7	Mechanisms of molecules interaction and enzyme works
8	Mechanisms of molecules interaction and enzyme works
9	Enzyme reaction inhibition
10	Control of enzyme activities
11	Enzymes kinetic
12	Enzymes kinetic
13	Lecture with excercises
14	Enzymes in industry, types of enzymes for industry, and enzyme immobilization technique
15	Enzymes in industry, types of enzymes for industry, and enzyme immobilization technique
16	Final Test
Literature / Sources	<ul style="list-style-type: none"> <li>- Gogfrey, T. and J. Reichet. 1986. Industrial Enzymology, the Application of Enzymes in industri, M. Stockton Press, New York</li> <li>- Price, N. C. dan L. Stevens. 1993. Fundamentals of Enzymology, Oxford Sci. Publ., New York</li> <li>- Shuler, M. L. dan F. Kargi. 1992. Bioprocess Engineering, Basic concepts, Prentice-Hall Int. Inc., USA</li> </ul>

