

## 16. Module XVI: Metabolism

### 16.1. Module Objectives

On completion of this module, the students will:

- Able to describe and define the metabolism processes and cycle, especially microbial metabolism along with their enzymes role.
- Able to define and describe enzymes function and characteristics as biocatalyze in metabolims processes and kinetic reaction; also their application in industries and daily life.
- Able to perform sample sampling and preparation along with metabolic analysis, especially the one that related to metabolics study and its application
- Able to construct the metabolic pathway

### 16.2. Module Data

Person in charge	Dr. Pingkan Aditawati
Total Credits	4
Course	BM3201 Metabolomics
	BM3102 Enzymology
Course Examination	Written Test

#### 16.2.1. Sub-module I: Metabolomics

Lecturer	Dr. Pingkan Aditawati
Semester	6
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	Laboratory work, textbook reading assignment, group discussion, presentation, paper review
Classification within the curriculum:	<del>General Studies</del> / Compulsory Course/ <del>Elective Course</del>
Type of assessment/examination	Written Test : Midterm exam, Final exam, Quizess, Assignments Presentation
Language	Bahasa Indonesia

Course Target / Outcome	Student understands metabolomics in system biology ; microbial metabolism, sampling method and sample preparation; analytical methods and analysis, and microbial metabolomic application. Students understand metabolic diversity of microorganism, and its effect on microbial niche
Teaching methods	Interactive Lecture
Contents (SAP)	
1	Introductory to Metabolomic
2	Metabolomic In Functional Genomics & System Biology
3	The Chemical Challenge of the Metabolome
4	Sampling & Sample Preparation
5	Analytical Tools
6	Data Analysis
7	Yeast Metabolomics : The Discovery of New Metabolic Pathways in <i>S. cerevisiae</i>
8	Microbial Metabolomics: Rapid Sampling Techniques to Investigate Intracellular Metabolite Dynamics - An Overview
9	Microbial Metagenomics: Concept, Methodology & Prospects for Novel Biocatalysts and Therapeutics from Mammalian Gut Microbiome
10	Plant Metabolomics
11	
12	Mass Profiling of Fungal Extracts from <i>Penicillium</i> Species
13	
14	Metabolomics in Humans and Other Mammals
15	
16	Final Test
Literature / Sources	<ul style="list-style-type: none"> <li>- Nielsen, J. &amp; Jewett, MC (2010) Metabolomics : a powerful tool in system biology. Springer</li> <li>- Lammerhofer, M. and Weckwerth, W (2012) Metaolomics in practice. Wiley – VCH</li> <li>- Silas GVB, Roessner U, Hansen MAE, Smedsgaard J, Nielsen J. (2006) Metabolome Analysis : An Introduction. Wiley Interscience.</li> <li>- Metabolomics : metabolites, metabonomics and analytical technologies. Ed: Knap JS, Cabrera WL. (2011). Nova Science Publishers.</li> </ul>

### 16.2.2. Sub-module II: Enzimology

Lecturer	Dr. 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:	<del>General Studies</del> / Compulsory Course/ <del>Elective Course</del>
Type of assessment/examination	Written Test : Midterm exam, Final exam, Assignments
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 I
	4 Classification and identification method of enzyme II
	5 Classification and identification method of enzyme III
	6 Mid-Term Test
	7 Mechanisms of molecules interaction and enzyme works I
	8 Mechanisms of molecules interaction and enzyme works II
	9 Enzyme reaction inhibition
	10 Control of enzyme activities

11	Enzymes kinetic I
12	Enzymes kinetic II
13	Lecture with exercises
14	Enzymes in industry: types of enzymes for industry
15	Enzymes in industry: enzyme immobilization technique
16	Final Test
Literature / Sources	<ul style="list-style-type: none"> <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>

