

1. Module XXVII: Techniques in Microbiology II

1.1. Module Objectives

On completion of this module, the students will:

- Able to understand the microorganisms community based on metagenomics approach along with its application
- Able to understand the basic technique for the cultivation of microorganism such as fungi and algae
- Able to predict the growth of microorganisms based on laboratory data by using a model
- Able to understand the implementation of microbial techniques in industrial scale

1.2. Module Data

Person in charge	Dr. Isty A. Purwasena
Credits	16
Course	BM4203 Metagenomics
	BM 4104 Microalgae cultivation technique
	BM3107 Project of Fungal Technology
	BM4109 Predictive Microbiology
Modules Examination	written test

1.2.1. Sub-module III: Metagenomics

Lecturer	Dr. Maelita R. Moeis
Semester	6
Type of submodule / course	Elective
Credits	2
Workload	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, small exhibition
Classification within the curriculum:	General Studies / Compulsory Course / Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Assignments
Language	Bahasa Indonesia
Course Target / Outcome	Students will be able to define metagenomics, and describe its research methods and application in various fields

Teaching methods	Interactive Teaching
Contents (weekly)	
1	The meaning of metagenomics
2	Research tools and methods in metagenomics
3	Integration of various complementary approaches to study microbial communities
4	Horizontal gene transfer
5	Metagenomics survey
6	Public Data
7	Research of plant-microorganisms interaction by using metagenomics
8	Mid-Term Test
9	Applications of metagenomics for bioremediation
10	Applications of metagenomics for industrial bioproduct
11	Bioprospect of new genes and exploration concepts
12	Applications of metagenomics to study human microbiome
13	Selected topic presentation
14	
15	
16	Final test
Literature / Sources	Marco, D., Metagenomics: Theory, Methods and Applications, Caister Academic Press, 2010, Pustaka utama
Other specialties	

1.2.2. Sub-module IV: Microalgae cultivation technique

Lecturer	Dr. I Gede Suantika
Semester	5
Type of submodule / course	Elective
Credits	3(1)
Workload	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	Laboratory work, group discussion, presentation, paper review, small exhibition
Classification within the curriculum:	General Studies / Compulsory Course / Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Quizess, Assignments
Language	Bahasa Indonesia

Course Target / Outcome	Students will be able to design and implement the proses of cultivating, havesting and preserving microalage.
Teaching methods	Interactive Laboratory Practices
Contents (weekly)	
1	Introduction
2	Vegetative and generative structure of algae
3	Reproduitiion system Sistem reproduksi
4	Role of microalgae
5	Introduction to general production of microalgae
6	
7	Mid-Term Test
8	Types of media and nutrition optimization for the growth of microalgae
9	
10	Cultivation techniques of microalgae
11	
12	Harvesting and preservation techniques of microalgae
13	
14	Presentation and individual assignments
15	
16	Final Test
Literature / Sources	<ol style="list-style-type: none"> 1. Andersen, R.A. 2005. Algal Culturing Techniques. Academic Press 2. Barsanti, L and Gualtieri, P. 2005. Algae: Anatomy, Biochemistry, and Biotechnology. CRC 3. Tortora, G. J.; Funke, B. R.; Case, C. L. 1995. Microbiology An Introduction. The Benyamin/Cumming Pub.Co.Inc. New York 4. Shubert, L.E. 1984. Algae as Ecological Indicators. Academic Press. Inc. London
Other specialties	

1.2.3. Sub-module V: Project of Fungal Techoology

Lecturer	Dr. I Nyoman P. Aryantha
Semester	5
Type of submodule / course	Elective
Credits	2
Workload	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, small exhibition

Classification within the curriculum:	General Studies / Compulsory Course/ Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Assignments Presentation
Language	Bahasa Indonesia
Course Target / Outcome	Students will be able to describe techniques in fungi handling for the purpose of research or the usage of fungi in industrial applications
Teaching methods	Interactive Teaching
Contents (weekly)	
	1 Horizon exploitation of fungi in life
	2 Development techniques for single strain fungi
	3 Maintenance and preservation techniques of fungi culture
	4 Inoculum preparation and enumeration techniques of fungi
	5 Production techniques of mycelium biomass
	6 Mid-Term Test
	7 Production techniques of fungi fruiting body biomass
	8 Extraction techniques of metabolites from fungi biomass
	9 Biological control techniques with the use of fungal agents
	10 Technology of Mycorrhiza
	11 Technology of mycoremediation
	12
	13 Presentation
	14
	15
	16 Final Test

Literature / Sources	<ol style="list-style-type: none"> 1. Cappucino, C.E., Sherman. 2005. Microbiology: A Laboratory Manual. Benjamin Cummings. Publ. Inc. Co. USA 2. Pointing, S.B and K.D. Hyde, 2001, Bio-Exploitation of Filamentous Fungi, Fungal Diversity Press, Hongkong 3. Mushworld, 2004, Oyster Mushroom Cultivation, (http://www.mushworld.com) 4. Brundrett, M. N. Bougher, B. Dell, T. Grove & N. Malajczuk, 1996, Working with Mycorrhizas in forestry and agriculture, ACIAR 5. Smith, J.E, Rowan, N. J, Sullivan, R., 2001, CRC Medicinal mushroom reports 6. Kavanagh, K, 2005, Fungi: Biology and Applications
Other specialties	

1.2.4. Sub-module VI: Predictive microbiology

Lecturer	Prof.Dr. Tjandra Setiadi
Semester	5
Type of submodule / course	Elective
Credits	2
Workload	2 hours lectures, 2 hours structured activities, 2 hours individual study, 16 weeks per semester, and total 96 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 assessment/examination	Written Test : Midterm exam, Final exam, Assignments
Language	Bahasa Indonesia
Course Target / Outcome	Students will be able to describe the process of generating a model from microbial data, including growth data, and implement the model in microbial applications
Teaching methods	Interactive Teaching
Contents (weekly)	
	1 Introduction of microbiology prediction
	2 Basic concept and method of microbiology prediction
	3
	4
	5 Modelling the effects of temperature to microorganisms
	6
	7 Mid-Term Test
	8 Modelling Microbial Growth

9	
10	Prediction of microbial survivalability in low temperatures
11	Safety evaluation of food component
12	Thermodynamics of bacterial growth
13	
14	Student Presentation
15	
16	Final Test
Literature / Sources	<p>1. McMeekin, T.A., Olley, J. N., and Ratowsky, D. A. 1993. Predictive Microbiology: Theory and Application. Research Studies Press</p> <p>2. Perez-Rodriguez, F. and Valero, A. 2013. Predictive Microbiology in Foods Springer</p>
Other specialties	

