

## 1. Module XXVIII: Microbial System III

### 1.1. Module Objectives

On completion of this module, the students will:

- Able to understand the basic principle of the interaction between microorganism and plant specially to increase the plant growth and productivity
- Able to characterize the life cycle, role and growth of fungi, bacteria and algae with their application in human life such as for industries, medical and environment.

### 1.2. Module Data

Person in charge	Ernawati A. Giri-Rachman
Credits	14
Courses	BM3108 Plant-microbes Interaction
	BM3204 Mycology
	BM3205 Bacteriology
	BM3206 Phycology
Modules Examination	Written Test

#### 1.2.1. Sub-module III: Microorganisms-plant interaction

Lecturer	I Nyoman P Aryantha, Rizkita Rahmi Esyanti
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:	<del>General Studies / Compulsory Course</del> -Elective Course
Type of assessment/examination	Written Test : Midterm exam, Final exam, Assignments Presentation
Language	Bahasa Indonesia
Course Target / Outcome	The knowledge can be used to combat agricultural lost due to disease and also increase beneficial plant microorganisms relationship. Student will also learn how increasing knowledge of plant-microorganisms interactions has allowed us to exploit microorganisms as biocontrol agents or as tools for biotechnology, how

	work with plant pathogens and symbionts to enable research to obtain important insights into the normal working of healthy plants.
Teaching methods	Interactive Teaching
Contents (SAP)	
	1 Microbial interaction: type and general mechanism
	2 Interaction between microorganisms and plant
	3 Requirement and mechanism in microorganism-plant interaction
	4 Mycorrhiza: interaction and mechanism
	5
	6 rhizobium-plant interaction and its benefits
	7 Mid-Term Test
	8 Plant infection by enzyme
	9 Plant infection by toxin
	10 Plant disease
	11 Genetic defense in plant
	12 Passive and active defense mechanism
	13 Nature-based commercial development of plant-microorganisms interaction
	14 Biotechnology commercial application of plant-microorganisms interaction
	15
	16 Final Test
Literature / Sources	Goodman, R.N., Kiraly,Z.&R.K.Wood. 1986. The Biochemistry and Physiology of Plant Disease. Univ.of Missouri Press. Columbia Isaac, S. 1992. Fungal Plant Interactions. Chapman & Hall. London Larkins,B. 1996. The Plant Cell : Plant-Microorganisms Interactions. American Society of Plant Physiologist. Rockvylle-Maryland
Other specialties	

### 1.2.2. Sub-module IV: Mycology

Lecturer	I Nyoman P Aryantha
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	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 Presentation
Language	Bahasa Indonesia
Course Target / Outcome	Students will be able to define the life cycle, role and growth of fungi and its application for daily activities
Teaching methods	Interactive Teaching
Contents (SAP)	
	1 introduction
	2 Small field trip
	3 Introduction to Mycology
	4 Slime mold
	5 Fungi Protista: Oomycota, Hypochitriomycota dan Chytridiomycota
	6 Zygomycetes, Trichomycetes, dan VAM
	7 Midterm test
	8 Deuteromycota: Hyphomycetes dan Coelomycetes
	9 Ascomycota mikroskopik: type of fruit bodies : Cleistothecial, Perithecial, Apothecial dan Pseudothecial
	10 Ascomycota makroskopik: Example of macroscopic Ascomycota
	11 Basidiomycota mikroskopik: Characteristics of Basidiomycota, Ustilaginomycetes, Pucciniomycetes
	12 Basidiomycota makroskopik: Mushrooms, Puffballs, Shelf fungi, Jelly fungi
	13 Toxic and edible fungi
	14 Presentation
	15
	16 Final test
Literature / Sources	<ol style="list-style-type: none"> <li>1. Landecker, E.M. 1996. Fundamental of Fungi. Prentice Hall Inc., New Jersey</li> <li>2. Wicklow, D.T. and B.E.Soderstrom. 1997. The Mycota. Springer Verlag, New York.</li> <li>3. Pointing, S.P. &amp; K. D. Hyde, 2001, Bio-exploitation of filamentous fungi, Fungal Diversity Press, Hongkong</li> <li>4. Kendrick, B., 1985, The Fifth Kingdom, Mycologue Publication, Waterloo</li> </ol>

### 1.2.3. Sub-module V: Bacteriology

Lecturer	Pingkan Aditiawati
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	Paper reading assignment, group discussion, presentation, paper review, small exhibition
Classification within the curriculum:	<del>General Studies / Compulsory Course</del> - 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 and discover the role of bacteria in life and environment
Teaching methods	Interactive Teaching
Contents (SAP)	
	1 Bacterial cell composition, structures, and function
	2 Baterial Growth
	3 Bacteria cell differentiation
	4 Metabolism energy in different type of bacteria
	5 Carbon metabolism pathway in different type of bacteria
	6 Cell communication in bacteria cell
	7 Mid-Term Test
	8 Gene regulation in bacteria
	9 Bacteriophage
	10 Bacteria systematic
	11
	12 The role of bacteria in environment
	13 The role of bacteria in industry
	14 The role of bacteria in medical
	15
	16 Final Test
Literature / Sources	<ol style="list-style-type: none"> <li>1. Singleton, P. 2004. Bacteria in Biology, Biotechnology and Medicine. John Wiley &amp; Sons, Ltd.</li> <li>2. Madigan, M. T., J. M. Martinko &amp; J. Parker, 2006. Brock Biology of Microorganisms, 11th ed. Pearson Prentice Hall International, Inc., New Jersey</li> <li>3. Sokatch, J. R. dan L. N. Ornston, 1986. The Bacteria, a treatise on structure and function, Akademik Press, Inc.</li> <li>4. 4. Goodfellow, M. dan A. G. O'Donnell, 1993, Handbook of New Bacterial Systematics, Academic Press, Inc.</li> </ol>
Other specialties	

#### 1.2.4. Sub-module VI: Phycology

Lecturer	Dr. Gede Suantika
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	Paper reading assignment, group discussion, presentation, paper review, small exhibition
Classification within the curriculum:	<del>General Studies / Compulsory Course</del> - 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 discover, define, and describe several aspects of Algae, which are: the characteristic as pro/eucaryotes organism, alga classification, generative and vegetative of algae, and another characteristics of alga (reproduction system, industries application, biology and microcosm model)
Teaching methods	Interactive Teaching
Contents (SAP)	
	1 Introduction Syllabus : general overview
	2 Basic Characteristics of The Algae
	3 The Prokaryotic Algae - Cyanobacteria
	4 The Eukaryotic Algae – Evolutionary Based Classification
	5 Rhodophyta and Chlorophyta
	6 Euglenophyta
	7 Dinophyta
	8 Mid-Term Exam
	9 Heterokontophyta - Bacillariophyceae
	10 Industrial Production of Microalgal Cell-Mass
	11 Microalgae in Human and animal nutrition
	12 Microalgae as renewable energy
	13 General Review
	14 General Review
	15 General Review
	16 Final Test
Literature / Sources	<ul style="list-style-type: none"> <li>Barsanti, L and Gualtieri, P. 2005. Algae: Anatomy, Biochemistry, and Biotechnology. CRC</li> </ul>

	<ul style="list-style-type: none"> <li>• Brock, T. D., Madigan, M. T., Martinko, J. M., Parker, J. 1997. <i>Biology of Microorganisms</i>. Prentice Hall International Inc. New Jersey.</li> <li>• Prud'homme van Reine, W.F. &amp; Trono Jr, G.C. (eds). 2002. <i>Plant Resources of South-East Asia</i>. no 15 (1). <i>Cryptogams ; Algae</i>. Prosea Foundation, Bogor, Indonesia</li> <li>• Hubert, L.E. 1984. <i>Algae as Ecological Indicators</i>. Academic Press. Inc. London.</li> </ul>
Other specialties	

