



Subject Module  
 Department of Agrotechnology  
 Faculty of Agriculture  
 University of Islam Malang

## Module Handbook

<b>Module Title</b>	Agricultural Microbiology
<b>Module Level, if available</b>	Undergraduate, Study Program of Agrotechnology
<b>Subject Code</b>	MKW 60617
<b>Headings, if available</b>	-
<b>Subject (MK)</b>	Basics of Microbiology
<b>Semester</b>	3
<b>Course Coordinator</b>	Novi Arfarita, SP, MP, M.Sc, Ph.D
<b>Teaching Team</b>	-
<b>Language of instruction</b>	Indonesian Language/English
<b>Linkages with the Curriculum</b>	Study Program : Agrotechnology Specialization: Agricultural Microbiology Type: Compulsory/ <del>elective</del>
<b>Learning Methods and Duration</b>	<ol style="list-style-type: none"> <li>1. Lecture: 100 minutes/meeting (14 meetings)</li> <li>2. Research Based Learning through Laboratory Work, experiment : 170 minutes/meeting (8 meetings)</li> <li>3. Assignments and Presentation (individual and group)</li> </ol>
<b>Student Study Load</b>	<ol style="list-style-type: none"> <li>1. Lecture: 100 minutes/meeting (14 meetings)</li> <li>2. Laboratory Work: 170 minutes/meeting (8 meetings)</li> <li>3. Assignments/quiz/presentation</li> <li>4. Attendance: 75% of total attendance</li> </ol>
<b>Credit Weight</b>	3 credits or 5.1 ECTS
<b>Requirements for Passing the Course</b>	<ul style="list-style-type: none"> <li>• Attendance &gt;75%</li> <li>• The final score of all the components of the learning evaluation &gt;44</li> </ul> The final score component: <ul style="list-style-type: none"> <li>• 20% Midterm Exam</li> <li>• 20% Final Exam</li> <li>• 30% Laboratory Work</li> <li>• 20% Assignments/Presentation (individual and group)</li> <li>• 10% Presence</li> </ul>
<b>Prerequisite Subject</b>	Biology of Agriculture
<b>Learning Outcomes</b>	The expected learning outcomes are: <ol style="list-style-type: none"> <li>1. Have an attitude of creative and innovative thinking in their work in accordance with professional ethics in the field of agriculture (ILO 1).</li> </ol>

	<ol style="list-style-type: none"> <li>2. Behave according to the professional code of ethics in agriculture based on the preaching of the Islamic faith of Ahlusunnah wal Jama'ah (ILO 2).</li> <li>3. Have good and deep knowledge in the field of basic agricultural science that supports Agrotechnology (ILO 3).</li> <li>4. Able to solve problems that arise in the field of agrotechnology and related fields of science (ILO 5).</li> <li>5. Able to apply various research methods in the field of Agrotechnology (ILO 7).</li> <li>6. Able to apply agricultural practices based on <i>Good Agricultural Practices</i> (ILO 8).</li> <li>7. Able to manage plant production system (ILO 9).</li> </ol>
<p><b>Learning Content</b></p>	<p>After completing this course students are able to:</p> <ol style="list-style-type: none"> <li>1. Identify the types of microorganisms, both macroscopic and microscopic.</li> <li>2. Analyze the factors that influence growth and development of microorganisms.</li> <li>3. Understand the role of microorganisms in life that are very influential for environment and aspects of human life.</li> <li>4. Utilize microorganisms to maintain soil fertility and as biological control agents.</li> <li>5. Linking the role of microorganisms to environment and preventing factors that are detrimental to environmental conditions and cultivated plants.</li> </ol> <p><b>The topics include:</b></p> <ol style="list-style-type: none"> <li><b>1. Introductions</b> <ul style="list-style-type: none"> <li>• Understanding and concepts of microbiology</li> <li>• History of Microbiology</li> <li>• Scope</li> <li>• Classification of microorganisms among living things</li> </ul> </li> <li><b>2. Microbial cells and their structure</b> <ul style="list-style-type: none"> <li>• Prokaryotic</li> <li>• Eukaryotic</li> <li>• Cell Structure</li> <li>• Structural function of cells</li> </ul> </li> <li><b>3. Environmental factors for microorganisms growth</b> <ul style="list-style-type: none"> <li>• Biotic factors</li> <li>• Abiotic factors</li> </ul> </li> <li><b>4. Nutrition and media for microorganisms</b> <ul style="list-style-type: none"> <li>• Nutritional Function for Microorganisms</li> <li>• Classification of microorganisms based on nutrients and oxygen</li> <li>• Growth Medium for Microorganisms</li> </ul> </li> <li><b>5. Microbial Growth manipulation and control</b> <ul style="list-style-type: none"> <li>• Physical</li> <li>• Chemistry</li> <li>• Biological</li> </ul> </li> <li><b>6. Metabolism of microorganisms</b> <ul style="list-style-type: none"> <li>• The basic concept of metabolism in microbes</li> <li>• Enzymatic Reactions</li> <li>• Energy Production</li> </ul> </li> <li><b>7. Plant diseases caused by Microorganisms</b></li> </ol>

	<ul style="list-style-type: none"> <li>• Pathogens from fungal group</li> <li>• Pathogens from bacterial group</li> <li>• Pathogens of Virus</li> </ul> <p><b>8. The role of microorganisms in the environment</b></p> <ul style="list-style-type: none"> <li>• Air</li> <li>• Water</li> <li>• Soil</li> </ul> <p><b>9. The role of microorganisms in soil fertility</b></p> <ul style="list-style-type: none"> <li>• Micro-habitat in the soil.</li> <li>• Microorganisms and plant nutrients.</li> <li>• Decomposition of organic matter and composting.</li> </ul> <p><b>10. The role of microorganisms in industrial world</b></p> <ul style="list-style-type: none"> <li>• Food, beverage, supplement industry.</li> <li>• Health product industry</li> <li>• Enzyme Industry</li> <li>• Chemical and fuel industry</li> </ul> <p><b>11. Bacteria</b></p> <ul style="list-style-type: none"> <li>• Morphology and characteristics of bacteria.</li> <li>• Principles of Classification of Bacteria.</li> <li>• Get to know the 10 orders of bacteria</li> </ul> <p><b>12. Fungi</b></p> <ul style="list-style-type: none"> <li>• General and special features of fungi.</li> <li>• The nature of life and reproduction of fungi</li> <li>• The basic principle of fungal classification</li> </ul> <p><b>13. Virus</b></p> <ul style="list-style-type: none"> <li>• Structure and morphology of Virus</li> <li>• Characteristics that distinguish viruses from inanimate objects</li> <li>• Types of viruses in plants</li> <li>• Role of Viruses in Life.</li> </ul> <p><b>14. Algae</b></p> <ul style="list-style-type: none"> <li>• Habitat</li> <li>• Morphological Characteristics</li> <li>• Type and role of Algae</li> <li>• Naming of Algae</li> </ul>
<b>Test Terms and Forms</b>	<p>Examination requirements: A minimum of 75 % attendance to attend the final exam</p> <p>Forms of examination: Essay</p>
<b>Learning Media</b>	<p>Projector and screen, Zoom application, Skype, e-book, WA Group, Practicum Manual, samples from the field and consumer goods for research-based learning.</p>
<b>References</b>	<p><b>Main References :</b></p> <ol style="list-style-type: none"> <li>1. Atlas, R.M. 1997. Principle of Microbiology, 2nd ed. WC Brown Publisher.</li> <li>2. USA Madigan, M.T., J.M. Martinko, and J. Parker. 2009. Brock Biology of Microorganisms. 12th edition. Prentice Hall International. Inc. USA</li> <li>3. Prescott, L.M., J.P. Harley, and D.A. Klein. 1999. Microbiology. 4th ed. WCB. McGraw-Hill, USA</li> </ol>

4. Tortora, G.J., B.R. Funke, and C.L. Case. 2007. *Microbiology an Introduction*, 9th ed. Benjamin Cummings, USA.

**Supporting References :**

1. **Arfarita, et.al. 2017.** Isolation of indigenous bacteria of phosphate solubilizing from green bean rhizospheres, *Journal of Degraded and Mining Lands Management*, 4(3),845-851.
2. **Arfarita, et.al. 2016.** Exploration of Indigenous Soil Bacteria Producing-Exopolysaccharides for Stabilizing of Aggregates Land Potential as Biofertilizer, *Journal of Degraded and Mining Lands Management*, 4(1), 697-702.
3. **Arfarita, et.al. 2016.** The Application of *Trichoderma viride* Strain FRP for Biodegradation of Glyphosate Herbicide in Contaminated Land, *Agrivita Journal of Agricultural Science*, 38(3), 275-281.
4. **Arfarita, et.al. 2016.** *Characterization of Protease-Producing Bacteria Isolated from Terasi*, *Journal of Biological Researches*, 21(1), 18-23.
5. **Arfarita, et.al. 2015.** Isolasi dan Identifikasi Bakteri Penghasil *Protease* yang Diskrining dari Terasi, *El-Hayah*, 5(3), 119 -122.
6. **Arfarita, et.al. 2014.** Potential use of soil-born fungi isolated from treated soil in Indonesia to degrade glyphosate herbicide. *Journal of Degraded and Mining Lands, Management*, 2(1), 63-68.
7. **Arfarita, et.al. 2014.** The potential use of *Trichoderma viride* strain FRP3 in biodegradation of glyphosate herbicide, *Biotechnology and Biotechnological Equipment*, 27(1), 3518-3521.
8. **Arfarita, et.al. 2011.** Screening of Soil-Born Fungi from Forest Soil Using Glyphosate Herbicide as the Sole Source of Phosphorus. *Journal of Water and Environment Technology*, 9, 391-400.