

Module Handbook of Agricultural Microbiomes

Module designation	Agricultural Microbiomes course is a compulsory subject intended for first semester students at the Faculty of Agriculture. This course describes the role of the microbiome in agriculture, as well as the interaction between microbes and the rhizosphere, plants, and insects.
Semester(s) in which the module is taught	First Semester
Person responsible for the module	Ir. Jaka Widada, M.P., Ph.D.
Language	Bahasa Indonesia/Indonesian Language
Relation to curriculum	<i>Compulsory Course</i>
Teaching methods	Lecture are conducted in the class with 80-100 students. In every meeting, there will be delivered interactive lecture and discussion. In some topics there will be quizzes, individual and/or group assignment. Details: 1. Lectures 2. Assignment (Individual and Group) 3. Discussion 4. Midterm 5. Final Exam 6. Laboratory Work
Workload (incl. contact hours, self-study hours)	<ul style="list-style-type: none"> - Lectures = 2 SKS x 50 minutes x 16 meetings = 1.600 minutes = 26,67 hours = 26,67 hours/30hours = 0,89 ECTS - Assignment = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/30hours = 1,07 ECTS - Self Study = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/30hours = 1,07 ECTS - Practicum = 1 SKS x 170 minutes x 16 meetings = 2.720 minutes = 45,33 hours = 45,33 hours/30hours = 1,51 ECTS <p>Total Workload = 4,54 ECTS</p>
Credit points	<i>2/1 Credit Points</i>
Required and recommended prerequisites for joining the module	<i>None</i>

<p>Module objectives/intended learning outcomes</p>	<p><i>Program Learning Outcomes (PLO):</i></p> <p><i>PLO1: Able to explain theoretical concepts of biology microorganism and develop microbial-based technology to increase plant production and environmental services.</i></p> <p><i>PLO2: Able to describe the latest methodology in the field of microbiology to create environmentally friendly and sustainable agricultural development.</i></p> <p><i>PLO3: Able to select, utilize and manage the potential of microbes and microbiomes to build industrial and agricultural systems.</i></p> <p><i>Course Learning Outcomes (CLO):</i></p> <p><i>CLO1: Students are able to explain the fundamental concept of microbiomes, encompassing their composition, functions, and roles in maintaining agricultural ecosystem balance.</i></p> <p><i>CLO2: Students are able to explain various patterns of microbial interactions and their relevance to agriculture.</i></p> <p><i>CLO3: Students are able to analyze and synthesize information related to the interactions between microorganisms and plants and insects, as well as their roles in supporting plant growth and health.</i></p>
<p>Content</p>	<ol style="list-style-type: none"> 1. <i>Introduction: Contract lectures, understanding of the history, definition of the microbiome, and introduction to the role of the microbiome in agriculture (1 meeting)</i> 2. <i>The World of Microbiology (1 meeting)</i> 3. <i>Microbial Cell Structure dan Function (1 meeting)</i> 4. <i>Theory of Microbial Metabolism (1 meeting)</i> 5. <i>Transformation of elements by microbes in the aquatic environment (1 meeting)</i> 6. <i>Transformation of elements by microbes in the terrestrial environment (1 meeting)</i> 7. <i>Microbial interaction patterns in relation to agriculture (1 meeting)</i> 8. <i>Plant microbiome and its role in Plant Health (1 meeting)</i> 9. <i>The microbiome of the rhizosphere and its role in plant growth (1 meeting)</i> 10. <i>The role of the microbiome in Plant Breeding (1 meeting)</i> 11. <i>The Insect Microbiome (1 meeting)</i> 12. <i>Soil Microbiome/ Environment and Environmental Pollution (1 meeting)</i> 13. <i>Microbiome Detection and Monitoring Process (1 meeting)</i> 14. <i>Microbiome Engineering Applications (1 meeting)</i>
<p>Examination forms</p>	<p><i>High Order Thinking Skills Examination</i></p>
<p>Study and examination requirements</p>	<p><i>To be able to take the final exams, the minimum of student attendance is 70% out of effective meetings. From 14 meetings, students must take a minimum of 10 meetings to take the exam.</i></p>

Reading list	<p><i>Main References:</i></p> <ol style="list-style-type: none">1. DeSalle, R. and Perkins, S.L. 2015. <i>Welcome to the Microbiome</i>. Yale University Press. (e-book available).2. Saleem, M. 2015. <i>Microbiome Community Ecology</i>. Springer. (e-book available)3. Doty, S.L. (ed). 2017. <i>Functional Importance of Plant Microbiome</i>. Springer. (e-book available)4. Beiko, R.G., Hsiao, W., and Parkinson, J. (eds). 2018. <i>Microbiome Analysis, Methods and Protocols</i>. Humana Press (e-book available)5. Egamberdieva, D. & Ahmad, P. (eds). 2018. <i>Plant Microbiome Stress Response</i>. Springer Singapore. (e-book available) <p><i>Additional references:</i> <i>Agricultural Microbiome Practical Book</i></p>
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