Module Handbook of Agro-industrial Microbiology

Module designation	Agro-industrial microbiology is a course designed specifically for students from Agricultural Microbiology study program, Department of Agricultural Microbiology, Faculty of Agriculture. This course focuses on the fundamentals of agro-industrial microbiology and how it applies to the agro-industrial field. The technology used in the industry based on microorganisms is also covered in this course.
Semester(s) in which the module is taught	Fourth Semester
Person responsible for the module	Prof. Ir. Triwibowo Yuwono, Ph.D.
Language	Bahasa Indonesia/Indonesian Language
Relation to curriculum	*Elective Course*
Teaching methods	Lecture are conducted in the class with 30-40 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)	- Lectures = 2 SKS x 50 minutes x 16 meetings = 1.600 minutes = 26,67 hours = 26,67 hours/27,1 hours = 0,98 ECTS - Assignment = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/27,1 hours = 1,18 ECTS - Self Study = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/27,1 hours = 1,18 ECTS - Practicum = 1 SKS x 170 minutes x 16 meetings = 2.720 minutes = 45,33 hours = 45,33 hours/27,1 hours = 1,67 ECTS Total Workload = 5,01 ECTS
Credit points	*2/1 Credit Points*
Required and recommended prerequisites for joining the module	*Biology of Microorganisms*

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<td>Module objectives/intended learning outcomes</td>
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Program Learning Outcomes (PLO):
PLO1: Able to explain theoretical concepts of biology microorganism and develop microbial-based technology to increase plant production and environmental services.
PLO2: Able to describe the latest methodology in the field of microbiology to create environmentally friendly and sustainable agricultural development.
PLO3: Able to select, utilize and manage the potential of microbes and microbiomes to build industrial and agricultural systems.

Course Learning Outcomes (CLO):
CLO1: Students can explain the fundamental concepts of Agroindustrial Microbiology.
CLO2: Students can explain about the microorganism-based industries and their products.
CLO3: Students can explain and use the technology used in microorganism-based industries.
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<td>Content</td>
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Introduction to Agro-industrial Microbiology (1 meeting)
Microbes used in industrial field (1 meeting)
Media for microorganism-based industries (1 meeting)
Microbial industrial products (1 meeting)
Culture Technique and Management (1 meeting)
Food Fermentation Industry (1 meeting)
Biofertilizer and Biopesticide Production (1 meeting)
Yeast-based fermented products (1 meeting)
Production of Phosphate Solubilizing and Growth Promoting Inoculum (1 meeting)
Production of Microbial Enzymes (1 meeting)
Solid Waste Management (1 meeting)
Antibiotic Fermentation (1 meeting)
Group presentation (1 meeting)
Materials Review (1 meeting)

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<td>Examination forms</td>
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High Order Thinking Skills Examination
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<tr><th colspan="4">Grade and Score</th></tr>
<tr><th>Grade</th><th>Score</th><th>Grade</th><th>Score</th></tr>
<tr><td>A</td><td>≥ 85</td><td>C+</td><td>64,0-66,9</td></tr>
<tr><td>A-</td><td>82,0-84,9</td><td>C</td><td>61,0-63,9</td></tr>
<tr><td>A/B</td><td>79,0-81,9</td><td>C-</td><td>58,0-60,9</td></tr>
<tr><td>B+</td><td>76,0-78,9</td><td>C/D</td><td>55,0-57,9</td></tr>
<tr><td>B</td><td>73,0-75,9</td><td>D+</td><td>52,0-54,9</td></tr>
<tr><td>B-</td><td>70,0-72,9</td><td>D</td><td>49,0-51,9</td></tr>
<tr><td>B/C</td><td>67,0-69,9</td><td>E</td><td><49</td></tr>
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Study and examination requirements	*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.*
Reading list	*Main References:* 1. *Hrudayanath, T. Pradeep, K., Sonali, M. Keshab, C. 2020. Microbial Fermentation and Enzyme Technology. CRC Press, Boca Raton.* 2. *Ray, Ramesh, C. Rosell, C. 2017. Microbial enzyme technology in foord application. CRC Press.* 3. *Farshad Darvishi Harzevili and Hongzhang Chen (Eds.). 2015. Microbial Biotechnology. Progress and Trends. CRC Press, Taylor and Francis Group.* 4. *Nduka Okafor and Benedict C. Okeke. 2018. Modern Industrial Microbiology and Biotechnology. Second edition. Taylor and Francis.* 5. *Peter F. Stanbury, Allan Whitaker, and Stephen J. Hall. 2017. Principles of Fermentation Technology. Third edition. Elsevier* *Additional references:* 1. *Scientific journals related to microbial ecology and their applications for environment* 2. *Laboratory Classes in Agro-industrial Microbiology Handbook*