

## Module Handbook of Microbial Physiology

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| Module designation                               | This course studies the intricacies of life, structure, and function of several microbial cell organs. This course also examines metabolic pathways and energy production, nutrition and their transport mechanisms, gene regulation and expression, macromolecule synthesis, microbial growth, and resistance to environmental changes. This knowledge strongly supports the development of microbiology disciplines and courses directly related to microbial genetics, food microbiology, environment, genetic engineering, and fermentation technology courses.                                                          |
| Semester(s) in which the module is taught        | Third Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Person responsible for the module                | Prof. Dr. Ir. Sebastian Margino                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Language                                         | Bahasa Indonesia/Indonesian Language                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Relation to curriculum                           | <i>Compulsory Course</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Teaching methods                                 | <p>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.</p> <p>Details:</p> <ol style="list-style-type: none"> <li>1. Lectures</li> <li>2. Assignment (Individual and Group)</li> <li>3. Discussion</li> <li>4. Midterm</li> <li>5. Final Exam</li> <li>6. Laboratory Work</li> </ol>                                                                                                                                                                             |
| Workload (incl. contact hours, self-study hours) | <ul style="list-style-type: none"> <li>- Lectures = 2 SKS x 50 minutes x 16 meetings = 1.600 minutes<br/>= 26,67 hours<br/>= 26,67 hours/27,1 hours<br/>= 0,98 ECTS</li> <li>- Assignment = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes<br/>= 32 hours<br/>= 32 hours/27,1 hours<br/>= 1,18 ECTS</li> <li>- Self Study = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes<br/>= 32 hours<br/>= 32 hours/27,1 hours<br/>= 1,18 ECTS</li> <li>- Practicum = 1 SKS x 170 minutes x 16 meetings = 2.720 minutes<br/>= 45,33 hours<br/>= 45,33 hours/27,1 hours<br/>= 1,67 ECTS</li> </ul> <p>Total Workload = 5,01 ECTS</p> |
| Credit points                                    | <i>2/1 Credit Points</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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| Required and recommended prerequisites for joining the module | <i>Biology of Microorganism</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Module objectives/intended learning outcomes                  | <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: Able to explain the structure and function of cells in microbial physiology, as well as understand microbial cell metabolism.</i></p> <p><i>CLO2: Able to discuss and provide examples of fermentation processes caused by the presence of microbes and their use in the fields of agricultural microbiology and industrial microbiology.</i></p> <p><i>CLO3: Able to describe materials for macromolecular synthesis, genetic information, and microbial growth and their applications in the fields of technology and industry.</i></p> |
| Content                                                       | <ol style="list-style-type: none"> <li><i>1. Introduction to microbial physiology, cell structure and function in microbial physiology (1 meeting)</i></li> <li><i>2. Nutrition, element cycles and environmental factors for microbes. (1 meeting)</i></li> <li><i>3. Nutrient processing and transport mechanisms (1 meeting)</i></li> <li><i>4. Central metabolism and microbial energy production (1 meeting)</i></li> <li><i>5. Nutrient uptake, substrate metabolism, various fermentation pathways and nitrogen metabolism (1 meetings)</i></li> <li><i>6. The role of precursors and energy-rich compounds in metabolism (1 meeting)</i></li> <li><i>7. Physiology of production of primary and secondary metabolism (1 meeting)</i></li> <li><i>8. Enzymes, regulation and gene expression in prokaryotic microbes (1 meeting)</i></li> <li><i>9. Macromolecule Synthesis (2 meetings)</i></li> <li><i>10. Genetic and genetic information in microbial physiology (1 meeting)</i></li> <li><i>11. Microbial growth and survival in a changing environment (1 meeting)</i></li> <li><i>12. Students Seminar (2 meetings)</i></li> </ol>        |

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| Examination forms                  | High Order Thinking Skills Examination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                    | Grade and Score                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                    | GradeScoreGradeScore                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                    | A≥ 85C+64,0-66,9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                    | A-82,0-84,9C61,0-63,9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                    | A/B79,0-81,9C-58,0-60,9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                    | B+76,0-78,9C/D55,0-57,9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                    | B73,0-75,9D+52,0-54,9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                    | B-70,0-72,9D49,0-51,9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| B/C67,0-69,9E<49                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 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:<br><br>1. Moat, A.J., J.W. Foaster, & M.P. Spector. 2002. Microbial Physiology. 4 ed. John Wiley & Sons. New York<br>2. Stephen R. Bolsover, Jeremy S. Hya, Elizabeth A. Shephard, Hugh A. White, Claudia G.<br>3. Wiedemann. 2004. Cell Biology. Scd Ed. Willey Liss. John Wiley & Son.<br>4. A. Bruce., J.A. Lewis, R. Martin, R. Keith and W. Peter. 2002. Molecular Biology of the Cell. Garland Publishing. New York<br>6. Inouye, M. 1979. Bacterial Outer Membranes: Biogenesis and Function. Wiley-Interscience. NY.<br>7. Hermann. K.M. and R.L. Somerville. 1983. Amino Acids: Biosynthesis and Genetic Regulation. Addison Reading. M.A.<br>8. Atlas, R.M. 1997. Principles of Microbiology. Wm. C. Brown Publishers. London Sydney Toronto.<br>9. Barbara Wexler. 2008. Genetic and Genetic Engineering. Information Plus. References Serie. Wiley. Texas.<br><br>Additional References:<br>Books related to microbial physiology and microbiology |