

Module Handbook of Enzyme Technology and Engineering

Module designation	This course is intended for students from the Agricultural Microbiology study program, Faculty of Agriculture. This course covers the basic concepts of enzymes, functions, mechanisms of enzyme work, environmental factors affecting enzyme performance. In addition, the course also discusses production, purification, immobilization, enzyme engineering and enzyme utilization in the fields of chemical, food, energy, and biosensor industries.
Semester(s) in which the module is taught	Fifth Semester
Person responsible for the module	Prof. Ir. Irfan D. Prijambada, M.Eng., Ph.D.
Language	Bahasa Indonesia/Indonesian Language
Relation to curriculum	<i>Elective Course</i>
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
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 Total Workload = 3,34 ECTS
Credit points	<i>2/0 Credit Points</i>
Required and recommended prerequisites for joining the module	<i>Enzymology</i>

Module objectives/intended learning outcomes	<i>Program Learning Outcomes (PLO):</i> <i>PLO1: Able to apply logical, critical, systematic, and innovative thinking by utilizing the technology of information to produce solutions according to the field of expertise with integrity and embodied in scientific documents.</i> <i>PLO2: Able to explain theoretical concepts of biology microorganism and develop microbial-based technology to increase plant production and environmental services.</i> <i>PLO3: Able to create, retrieve and present data obtained in research, and able to utilize biological data banks.</i> <i>Course Learning Outcomes (CLO):</i> <i>CLO1: Students are able to explain the basic concept of enzymes, their functions, the mechanism of enzyme action, and mention environmental factors that influence enzyme performance.</i> <i>CLO2: Students are able to explain the techniques of isolation, production, purification, immobilization, and engineering of enzymes</i> <i>CLO3: Students are able to explain the techniques of isolation, production, purification, immobilization, and engineering of enzymes.</i>
Content	1. <i>Introduction to Enzyme Technology and Engineering: Outline of courses, functions and mechanisms of enzyme work (1 meeting)</i> 2. <i>Effects of Environmental Factors on Enzyme Performance (1 meeting)</i> 3. <i>Heterological Enzyme Production. (1 meeting)</i> 4. <i>Enzyme Purification. (1 meeting)</i> 5. <i>Immobilized Enzymes (1 meetings)</i> 6. <i>Enzyme Coupling for Coenzyme Regeneration. (1 meeting)</i> 7. <i>Fusion coupling enzyme. (1 meeting)</i> 8. <i>Rational Engineering of Enzymes. (1 meeting)</i> 9. <i>Enzyme Engineering with Directed Evolution. (1 meeting)</i> 10. <i>Man-made enzyme (1 meeting)</i> 11. <i>Enzyme Utilization for Chemical and Polymer Industries (1 meeting)</i> 12. <i>Enzyme Utilization for Chemical and Polymer Industries (1 meeting)</i> 13. <i>Enzyme Utilization for Biosensors (1 meeting)</i> 14. <i>Materials Review (1 meeting)</i>

Examination forms	<i>High Order Thinking Skills Examination</i>			
	Grade and Score			
	Grade	Score	Grade	Score
	A	≥ 85	C+	64,0-66,9
	A-	82,0-84,9	C	61,0-63,9
	A/B	79,0-81,9	C-	58,0-60,9
	B+	76,0-78,9	C/D	55,0-57,9
	B	73,0-75,9	D+	52,0-54,9
	B-	70,0-72,9	D	49,0-51,9
	B/C	67,0-69,9	E	<49
Study and examination requirements	<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>			
Reading list	<i>Main References:</i> <i>Nelson, D. L. and M. M. Cox. 2005. Lehninger Principles of Biochemistry 4th Edition. W. H. Freeman, United Kingdom.</i> <i>Additional References:</i> <i>Enzymology related books</i>			