Module designation	Fermentation and Enzyme Technology
Semester(s) in which the module is taught	Even Semester
Person responsible for the module	Prof. Dr. Ir. Lies Mira Yusiati, SU., IPU Prof. Ir. Zaenal Bachruddin, M.Sc., Ph.D., IPU Dr. Ir. Chusnul Hanim, M.Si, IPM Dr. Ir. Asih Kurniawati, S.Pt., M.Si., IPM Muhlisin, S.Pt., M.Agr., Ph.D
Language	Bahasa and English
Relation to curriculum	Specialization's elective
Teaching methods	Classical lecture, discussion, and lab works.

Workload (incl. contact hours, self-study hours)	Total workload: 82 hours
	
	Contact hours:
	  – Lecture: 12 hours
	  – Academic activity: 14 hours
	  – Practicum: 42 hours
	
	Private study: 14 hours

Credit points	1/1
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Course Outcomes (CO): 1. Understand the importance of feedstuffs quality control during Students can explain the fermentation process and its application in the world of animal science. 2. Students can explain the process on producing proteins, especially enzymes and the application of enzyme technology. 3. Students are able to design simple research, analyze and report related to fermentation and enzyme technology. Expected Learning Outcomes: – Attitudes and Behaviors: 1. Showing the social sensitivity and attention to the community and environment by respecting the culture diversity, view, religious, beliefs, and other people's opinion, and also obey the rules. (CO3) 2. Be accountable in carrying the professional practice that includes ability to accept accountability towards decision and professional action. It shall be according to the scope of the practice under their responsibility and laws. (CO3) – Mastery in Sciences: 1. Able to master the current animal science and its application theory. (CO1, CO2) 2. Able to master the livestock production science, animal nutrition and fed science, animal products technology, and the livestock social economics in relation to food security and environment. (CO1, CO2) – Special skills: 1. Able to design interdisciplinary and multidisciplinary research in the animal husbandry. (CO1, CO2) – General skills:

	1. Able to communicate the result of reasoning and scientific research in form of thesis and scientific writing responsibly based on academic ethics in the accredited national journal. (CO3) 2. Able to maintain the academic integrity generally and avoid the plagiarism practice. (CO3)
Content	Fermentation has such a broad scope, including those related to animal science. By knowing the meaning of the fermentation process, the purpose and its benefits to the farm, will underlie us in improving the development of fermentation technology, including enzyme technology in the animal science, in which it is necessary in handling animal products and waste, production of additives, improving the quality and efficiency of feed utilization and evaluation. Based on this description it is no wonder is students study microbial metabolism in various types of fermentation, learn how to get superior microbial isolates and how to improve fermentation efficiency. With an active learning system that focuses on student involvement in discussions, and supported by practical material that is always related to the lecture unit, it's expected that students will easily understand all the topics in lectures. The evaluation system that are agreed by the students are: quiz, midterm, and final exam, as well as paper presentation. Those four- evaluation system are claimed to be effective in giving the right evaluation results. The course of Fermentation and Enzyme Technology discusses the meaning of fermentation processes, scope, objectives and their relation to enzyme technology, and their application in animal science that includes handling livestock products and wastes, producing additives, improving the quality and efficiency of feed utilization and feed evaluation, explaining about fermentation media, metabolism of nutrients by microbes, microbial growth and analysis of fermentation kinetics. Metabolic regulation is explained to get selected isolates and followed by procedures in microbial preservation as a starter and its application in the industrial world. This course also discusses the mechanism of work and the kinetic of enzymatic reactions, followed by procedures for isolation, enzyme purification, and purification of other fermented products. Applied genetic engineering is studied in order to increase the efficiency of fermentation products, ended by studying various enzyme production and fermentation technologies.

Exams and assessment formats	Assessment Components	Course Outcomes (CO)	Percentage (%)
	1. Midterm exam (written test, take home exam, paper assignment)	CO1	25
	2. Final exam (written test, take home exam, paper assignment)	CO2	25
	3. Presentation	CO3	10
	4. Practicum	CO3	40
	Grade and Score		
	Grade	Score	Grade	Score
	A	≥80	C+	45-49,9
	A-	75-79,9	C	40-44,9

	A/B	70-74,9	C-	35-39,9
	B+	65-69,9	C/D	30-34,9
	B	60-64,9	D+	25-29,9
	B-	55-59,9	D	20-24,9
	B/C	50-54,9	E	0-19,9
Study and examination requirements	The final grade in the module is composed of 25% performance on Midterm exam, 25% final exam, 10% presentation, 40% practicum. Students must have a final grade of 70% or higher to pass			
Reading list	– Price, N.C. and L. Stevens. 1989. Fundamentals of Enzymology. 2nd Ed. Oxford University Press, New York. – Palmer, T. 1991. Understanding Enzymes. 3rd Ed. Ellis Horwood Limited, England. Gemeiner, P. 1992. Enzyme Engineering Immobilized Biosystems. Ellis Horwood Limited, England. – Lehninger, A. L., 1975. Biochemistry. 2nd Edition. Worth Publisher, Inc. – Nelson, D.L. and M.M. Cox. 2000. Lehninger Principlesof Biochemistry. 3rd Ed. Worth Publisher, Inc. New York. – Abraham, W., P. Handler and E.L.Smith. 1973. Principles of Biochemistry. 5th Ed. Mc Graw Hill Kogakusha, Ltd. – Stryer, L. 1998. Biochemistry. 4th Ed. W.H. Freeman and Co., New York. – Stansbury, P. and A. Whitaker. 1987. Principles of Fermentation Technology. Pergamon Press. Oxford. – Brock, T.D. and M.M. Madigan. 1991. Biology of Microorganisms. 6th Ed. Prentice hall, EngelwoodCliffs, New Jersey. – Tortora, G.J., B.R. Funke and C.L. Case. 2001. Microbiology an Introduction. Addison Wesley Longman, Inc., San Fransisco. – Albert, B., D. Bray, J. Lewis, M. Raff, K. Roberts and J. D. Watson. 1994. Molecular Biology of The Cell. 3rd Ed. Garland Pub., Inc., New York and London.			