Module Handbook
Master in Animal Science UGM

Module designation	Animal Microbiology
Semester(s) in which the module is taught	Odd Semester
Person responsible for the module	Dr. Ir. Chusnul Hanim, M.Si., IPM., ASEAN Eng. Prof. Dr. Ir. Lies Mira Yusiati, SU., IPU., ASEAN Eng. Prof. Ir. Zaenal Bachrudin, M.Sc., Ph.D., IPU., ASEAN Eng. Dr. Ir. Asih Kurniawati, S.Pt., M.Si., IPM. Muhlisin, S.Pt., M.Agr., Ph.D., IPP.
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. Students can explain the types and roles of microbes, fungi, and gastrointestinal protozoa
	2. Students can explain degradation, nutrient metabolism, and their interaction in rumen microbial cells.
	3. Students can explain the kinetic and manipulation of fermentation in rumen.
	4. Students can explain genetic engineering of gastrointestinal microbes.
	5. Students are able to design simple research, analyse, and create report.
	
	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. (CO5)
	  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. (CO5)
	
	– Mastery in Sciences:
	
	  1. Able to master the current animal science and its application theory. (CO1, CO2, CO3, CO4)
	  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, CO3, CO4)
	
	– Special skills:

	1. Able to design interdisciplinary and multidisciplinary research in the animal husbandry. (CO1, CO2, CO3, CO4) – 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. (CO5) 2. Able to maintain the academic integrity generally and avoid the plagiarism practice. (CO5)
Content	The growth, production, and reproduction of ruminants and non-ruminants are determined by microbial activities (bacteria, protozoa, and fungi) in rumen and other digestive tracts, in which, they interact each other. The Animal Microbiology course begins by discussing classification and role of bacteria, protozoa, and fungi in the ecology of digestive tract. Biochemical interactions between microbes-microbes and microbes-host animal will be explained. The study of microbial activity at the process of fermentation in the digestive tract, followed by and understanding of metabolic interactions between microbes need to be studied including the strategy to adjust fermentation to maximize efficiency. Continuous fermentation analysis, theory and application of rumen simulation techniques in the feed evaluation will be explained. Later, microbial genetic engineering and fermentation manipulation will be discussed to produce probiotics and prebiotics and their application in the digestive tract to improve livestock performance. Inter-microbial interaction studies in the feed utilization need to be conducted to support the implementation of environmental-friendly livestock and the achievement of efficient livestock production.

Exams and assessment formats	Assessment Components	Course Outcomes (CO)	Percentage (%)
	1. Midterm exam (written test, take home exam, paper assignment)	CO1 & CO2	21
	2. Final exam (written test, take home exam, paper assignment)	CO1, CO3 & CO4	21
	3. Presentation	CO5	8
	4. Practicum	CO5	50

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 21% performance on Midterm exam, 21% final exam, 8% presentation, 50% practicum. Students must have a final grade of 70% or higher to pass
Reading list	– Murray, R. K., D. K. Granner, P.A. Mayes, V.W. Rodwell. 2003. Harper's Illustrated Biochemistry, 26th Ed. Lange Medical Books/McGraw-Hill – Hobson, P. N. and C. S. Stewart.1997. The Rumen Microbial Ecosystem. Blackle Academic & Professional

	– Nelson, D. L. and M. M. Cox. 2010. Lehninger Principles of Biochemistry. 4th Ed.