06 December 2018

Course: Forage Engineering and Feed Technology

1. **Type** **:** Specialization's Compulsory
2. **Code** **:** PTN 6102
3. **Credit** **:** 2/0
4. **Semester** **:** Odd
5. **Description** **:**

   Indonesia is a tropical land with two seasons in a year: rainy and dry season, causing strong fluctuation in the forage supply. In rainy season, there are plenty forage supply but very limited supply in the dry season, this too, depends on the length of the dry season. Supply of concentrated feed ingredients derived from grains and agricultural industry by-products are strongly influenced by the harvesting season. The supply of feed tends to be abundant during harvesting season and far less available on post-harvest and planting season. Crops by-products supply are very volatile following the main crops harvest. The course of Forage Engineering and Feed Technology is designed to equip student to be competent in feed crop engineering, both genetically and on farm (agronomy or physiology) towards plant growth, production and quality of tropical forage, forage conservation technology, increase the quality of agricultural crop residues (roughage), as well as concentrate processing and storing system.

6. **Course Outcomes (CO)**

   CO 1 : Understand the basic principle of forage conservation and increase the quality of agricultural crops, as well as procedures in processing feed concentrate.

   CO 2 : Understand the chemical changes that occurred during the conservation and feed treatment, understand the effects of conservation and feed treatment towards feed fermentation in the rumen and livestock performance.

   CO 3 : Understand the mechanism changes in chemical composition, digestibility, and storage capacity of feed ingredients and finished feed, as a result of processing and storage.

   CO 4 : Able to formulate and solve problems in the cultivation of grass and legume plants, able to choose the right technique for the cultivation of feed crops (grass and legume) according to tropical climate.

   CO 5 : Master the techniques in the feed engineering both genetically and on farm (agronomy and physiology) towards the plant growth and production.

7. **The Alignment Between CO and ELO**

CO*	ELO**																
	A				B			C				D					
	1	2	3	4	1	2	3	1	2	3	4	1	2	3	4	5	6
CO 1				✓		✓											
CO 2					✓		✓		✓			✓					
CO 3							✓		✓			✓					
CO 4				✓			✓				✓			✓			
CO 5				✓			✓			✓			✓		✓		

*CO refers to point 6.

**Expected Learning Outcomes (ELO) are written below,

A. Attitudes and Behaviors	
The graduates are able to behave well, correctly, and culturally as the result of internalization and actualization of values and norms, which is reflected in a spiritual and social life through learning process, experience, research, and/or community development in the animal husbandry.	
1	Piety to God and be able to show religious attitude and maintain the humanity values in carrying the task, which is based on religion, moral, and ethics.
2	Be proud and love the homeland show nationalism, and contribute to the improvement of the life quality in the community, nation and country, and the advancement of civilization according to Pancasila.
3	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.
4	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.
B. Mastery in Sciences	
Master the theory of the current science in the animal husbandry and its application.	
1	Able to master the current animal science and its application theory.
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.
3	Able to master the design, management, and development of livestock research.
C. Special Skills	
The graduates are able to develop science, technology, and arts in the animal husbandry through interdisciplinary/multidisciplinary innovative and tested research.	
1	Able to make innovation in the animal husbandry based on the development of science and technology.
2	Able to design interdisciplinary and multidisciplinary research in the animal husbandry.
3	Able to formulate and solve problems in the national development especially in terms of animal husbandry.
4	Able to solve problems and anticipate issues in the development of animal science and industry.
D. General Skills	
The graduates are able to manage resources by utilizing science, technology, and arts to solve problems in the animal husbandry with current science and also conduct research with accountability and full responsibility.	
1	Able to develop logical, critical, systematic, and creative thought through scientific research, creation of design in the science and technology, which pays attention and applies humanity values according to their expertise. The graduates are able to arrange scientific concept and the study result based on the principles, procedures, and scientific ethics.
2	Able to identify the science that becomes their research object and position it to a research map by using information technology in the context of science development and expertise implementation developed through interdisciplinary or multidisciplinary approaches.
3	Able to make a decision in the context of solving problems in the development of science and technology, which pays attention and applies humanity values based on analysis study or experiment towards information and data.
4	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.
5	Able to maintain the academic integrity generally and avoid the plagiarism practice.
6	Able to communicate spoken and written English effectively by using the information technology for the development of animal science and its implementation.

8. Course Content

Week	CO	Topic/Subtopic	Learning Activity	Assessment Tools	Allocated Time	Lecturer
1	CO 3	Introduction: forage engineering based on breeding techniques	Classical lecture and discussion	Midterm	1 hour 40 minutes	Nafiatul Umami
2	CO 4	Forage engineering based on breeding techniques	Classical lecture and discussion	Midterm	1 hour 40 minutes	Nafiatul Umami
3	CO 4; CO 5	Production management on planting/cultivation	Classical lecture and discussion	Midterm, quiz	1 hour 40 minutes	Bambang Suhartanto
4	CO 4; CO 5	Production management on planting/cultivation	Classical lecture and discussion	Midterm, quiz	1 hour 40 minutes	Bambang Suhartanto
5	CO 5	Intercropping system on improving forage and pasture quality	Classical lecture and discussion	Midterm, quiz	1 hour 40 minutes	Bambang Suhartanto
6	CO 4; CO 5	Forage engineering/ manipulation	Flip class, e-learning assignment	Midterm	1 hour 40 minutes	Bambang Suwignyo
7	CO 4; CO 5	Forage engineering/ manipulation	Flip class; e-learning assignment	Presentation	1 hour 40 minutes	Bambang Suwignyo
Midterm Examination						
8	CO 1; CO 2	Forage conservation: • Principles on ensilage • Haylage and bailage	Classical lecture, discussion	Final exam	1 hour 40 minutes	Andriyani Astuti
9	CO 1; CO 2	Forage conservation: • Forage drying • Hay and nutrient alteration	Classical lecture, discussion	Final exam. quiz	1 hour 40 minutes	Andriyani Astuti

10	CO 1; CO 2	Feed quality improvement: • Principles of physical treatments	Classical lecture; discussion	Final exam	1 hour 40 minutes	Cuk Tri Noviandi
11	CO 1; CO 2	Feed quality improvement: • Principles of chemical treatment • Chemical effect on ruminal fermentation and animal performance	Classical lecture, discussion	Final exam and quiz	1 hour 40 minutes	Cuk Tri Noviandi
12	CO 1; CO 2	Feed quality improvement: • Principles of biological treatment • Chemical effect on ruminal fermentation and animal performance	Classical lecture, discussion	Final exam and quiz	1 hour 40 minutes	Prof Ristianto Utomo
13	CO 2	Complete feed: • Principles of complete feed • Complete feed vs silage	Classical lecture, discussion	Final exam and quiz	1 hour 40 minutes	Prof Ristianto Utomo
14	CO 3	Processing and storing of concentrate: • Principles of processing and storing	Classical lecture, discussion	Final exam and quiz	1 hour 40 minutes	Prof.Ali Agus

		• Concentrate quality during storing				
Final Examination						

9. Assessment

Component	CO	Percentage (%) for final grade	Minimum Satisfactory Level
Midterm	CO 4; CO 5	40	70
Quiz	CO 4; CO 1	20	70
Final exam	CO 1; CO 2; CO 3	40	70
Total		100	

10. Lecturer

1. Tim Dosen

11. Reference