

**Course: Advanced Milk Science and Technology**

1. **Type** : Specialization's Elective
2. **Code** : PTH 6405
3. **Credit** : 2/0
4. **Semester** : Odd
5. **Description** :

This course is the advanced course of milk science and technology in the bachelor degree program. This course discusses milk chemistry and structure composition, physical chemistry and component characteristics of milk, nutrition facts, milk protein application in food and non-food industry, milk microbiology in connection with the fermented milk starter development, the development of functional milk product, probiotics and prebiotics application, and updated research concerning to the milk technology and science. The expectation derived from taking this course is students can be more comprehensive in understanding milk science and its technology and surely its application in the milk industry.

**6. Course Outcomes (CO)**

- CO 1 : Students are able to mention the milk component and explain the structure of milk physico-chemistry.
- CO 2 : Students are able to analyse and evaluate the development of milk technology.
- CO 3 : Students can explain the theoretical concept application of milk technology

**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 refers to point 6.

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

<b>A. Attitudes and Behaviors</b>	
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>B. Mastery in Sciences</b>	
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 feed 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.
<b>C. Special Skills</b>	
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.
<b>D. General Skills</b>	
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 1	Introduction: <ul style="list-style-type: none"> <li>Physical and chemical structure of milk</li> <li>Chemical content of milk</li> </ul>	Classical presentation and discussion	Midterm	2 x 50 minutes	Prof. Dr. Ir. Nurliyani, MS., IPM
2	CO 1	Milk protein:	Classical presentation	Midterm	2 x 50 minutes	Prof. Dr. Ir.

		<ul style="list-style-type: none"> <li>• Casein structure and characteristic</li> <li>• Whey structure and characteristic</li> </ul>	and discussion			Nurliyani, MS., IPM
3	CO 1	Physico-chemical characteristic of milk: Solubility, hydration, rheology, surface activity, gelation	Classical presentation and discussion	Midterm	2 x 50 minutes	Prof. Dr. Ir. Nurliyani, MS., IPM
4	CO 1	Characteristic of milk's lipid and carbohydrate	Classical presentation and discussion	Midterm	2 x 50 minutes	Prof. Dr. Ir. Nurliyani, MS., IPM
5	CO 1	Nutrient value of milk: <ul style="list-style-type: none"> <li>• The importance of milk nutrient</li> <li>• Milk consumption and health benefit</li> </ul>	Classical presentation and discussion	Midterm	2 x 50 minutes	Prof. Dr. Ir. Nurliyani, MS., IPM
6	CO 2; CO 3	Milk protein application on food and non-food industry: <ul style="list-style-type: none"> <li>• Casein application</li> <li>• Whey application</li> </ul>	Classical presentation and discussion	Midterm	2 x 50 minutes	Prof. Dr. Ir. Nurliyani, MS., IPM
7	CO 1	Milk and products microbiology	Classical presentation and discussion	Midterm	2 x 50 minutes	Widodo, SP., M.Sc., Ph.D.

**Midterm Examination**

8	CO 1	The development of fermented-milk starter: <ul style="list-style-type: none"> <li>• Selection and lactic acid bacteria identification</li> <li>• GRAS</li> <li>• Starter application</li> </ul>	Classical presentation and discussion	Final exam	2 x 50 minutes	Widodo, SP., M.Sc., Ph.D.
9	CO 2	Functional milk products: <ul style="list-style-type: none"> <li>• Micronutrient</li> <li>• Bioactive compounds</li> </ul>	Classical presentation and discussion	Final exam	2 x 50 minutes	Prof. Dr. Ir. Nurliyani, MS., IPM
10	CO 2; CO 3	Probiotic and prebiotic application: <ul style="list-style-type: none"> <li>• Probiotic, prebiotic, and symbiotic</li> <li>• Local lactic acid bacteria isolate</li> </ul>	Classical presentation and discussion	Final exam	2 x 50 minutes	Widodo, SP., M.Sc., Ph.D.
11	CO 2; CO 3	Review on milk research progress	Classical presentation and discussion	Paper	2 x 50 minutes	Widodo, SP., M.Sc., Ph.D.
12	CO 2; CO 3	Paper presentation	Classical presentation and discussion	Student presentation	2 x 50 minutes	
<b>Final Examination</b>						

### 9. Assessment

Component	CO	Percentage (%) for final grade	Minimum Satisfactory Level
Midterm			70
Final exam			70
Presentation			70

Paper			70
Practicum			70
<b>Total</b>		100	

**10. Lecturer**

1. Prof. Dr. Ir. Nurliyani, MS., IPM.
2. Widodo, SP., M.Sc., Ph.D.

**11. Reference**

1. Axelsson, L. 2004. Lactic Acid Bacteria: Classification and Physiology. P. 1–67 in Lactic Acid Bacteria: Microbiology and Functional Aspects, Marcel Dekker, Inc, New York.
2. Chandan, R. C. 2006. Manufacturing Yogurt and Fermented Milks. Blackwell Publishing Company, United State of America.
3. Lee, Y. K., and S. Salminen. 2009. Handbook of Probiotics and Prebiotics. 2nd ed. New Jersey: John Wiley and Sons.
4. Margolles, A., B. Mayo, and P. Ruas-Madiedo. 2009. In Handbook of Probiotics and Prebiotics. P. 4–24 in In Handbook of Probiotics and Prebiotics, John Wiley & Sons Inc. Hoboken.
5. Widodo, T. T. Taufiq, E. Aryati, A. Kurniawati, and W. Asmara. 2012. Human Origin Lactobacillus casei Isolated from Indonesian Infants Demonstrating Potential Characteristics as Probiotics in vitro. Indones. J. Biotechnol., 17 (I):79–89.