



Curriculum: Veterinary Science  
Course Title: Applied Animal Nutrition  
Course Code: VSID 775

Degree Level:  Bachelor's  Postgraduate Certificate  Master's  Advanced Postgraduate Certificate  Doctorate  
Faculty/College: Faculty of Veterinary Science  
Department: Preclinical and Applied Animal Science

## Details of the Course

### Section 1: General Information

#### 1. Course Code and Title:

Thai: สพคร ๗๗๕ โภชนศาสตร์สัตว์ประยุกต์

English: VSID 775 Applied Animal Nutrition

#### 2. Number of Credits: 3 (2-3-5)

(Theory: 2 hours, Practical Laboratory: 3 hours, Self-study: 5 hours per week)

#### 3. Curriculum and Type of Course:

3.1 Curriculum: Master of Veterinary Science

3.2 Type of Course: Core Course

Compulsory  Elective

#### 4. Instructor(s) Responsible and Teaching Instructors:

##### 4.1 Instructors Responsible for the Course:

Asst. Prof. Dr. Surasak Jittakhot, Department of Preclinical and Applied Animal Science

Phone: 086-888-9352

E-mail: surasak.jit@mahidol.edu

##### 4.2 Teaching Instructor:

Asst. Prof. Dr. Surasak Jittakhot, Department of Preclinical and Applied Animal Science

Phone: 086-888-9352

E-mail: surasak.jit@mahidol.edu

##### 4.3 Laboratory Scientist:

Dr. Kunaporn Homyok, Center for Veterinary Diagnosis (CVD)

Phone: 081-810-8683

E-mail: kunaporn.hom@mahidol.edu



Mrs. Samatchaya Vichajuthakul, The Center for Veterinary Diagnosis (CVD)

Phone: 087-680-4642

E-mail: samatchaya.pen@mahidol.edu

5. **Semester / Year of Study:**

5.1 Semester: 1

5.2 Number of Students: Approximately 10

6. **Pre-requisite Courses:** None

7. **Co-requisite Courses:** None

8. **Last Updated:** 24 June 2024

## Section 2: Course Goals and Description

### 1. Course Goals:

The course aims to equip students with a thorough understanding of applied animal nutrition, integrating theoretical knowledge with practical laboratory skills. Students will learn to determine nutrient requirements, analyze digestive processes, and characterize feed composition through proximate and Van Soest analysis. They will develop the ability to formulate balanced rations for various species, perform energy calculations for both ruminants and non-ruminants, and design and analyze nutrition experiments. Practical laboratory techniques, such as sample preparation and feed analysis, will be emphasized, culminating in the synthesis and presentation of findings through systematic reviews and meta-analyses. By the end of the semester, students will be well-prepared for roles in animal health, diet formulation, and nutritional research.

### 2. Course Description:

Applied animal nutrition, nutrient requirements, digestive processes, feed composition analysis, ration formulation, cattle, poultry, companion animals, swine, horses, wildlife, proximate analysis, Van Soest analysis, feed energy calculation, ruminants, non-ruminants, nutrition experiment design, sample preparation, feed analysis, systematic reviews, meta-analyses, outcome presentations, animal health, diet formulation, nutritional research



### Section 3: Objectives, Learning Outcomes, and Course Operation Plan

#### 1. Course Objectives:

1. Understand Nutrient Requirements: Analyze and determine the nutrient needs for various livestock, horses, companion and wildlife animal classes, including maintenance, growth, lactation, and reproduction.
2. Explore Digestive Processes: Comprehend the digestive systems of ruminants and monogastric animals, focusing on their differences and factors affecting digestion and absorption.
3. Perform Feed Composition Analysis: Conduct proximate and Van Soest analyses to characterize feedstuffs and evaluate their nutritional value.
4. Develop Ration Formulation Skills: Formulate balanced diets for cattle, poultry, companion animals, swine, horses, and wildlife using manual and computerized techniques.
5. Calculate Feed Energy: Accurately calculate the energy content of feeds for both ruminants and non-ruminants, integrating practical exercises.
6. Design and Analyze Experiments: Apply experimental design principles and statistical methods to conduct and analyze animal nutrition research.
7. Synthesize and Present Findings: Summarize laboratory results and effectively present findings through systematic reviews, meta-analyses, and outcome presentations.

#### 2. Course-level Learning Outcomes (CLOs):

By the end of the course, students who successfully complete this course will be able to

CLO1: Explain the principles of nutrient requirements and feed composition for various classes of livestock, horses, companion and wildlife animal.

CLO2: Analyze and compare the digestive processes in ruminants and monogastric animals.

CLO3: Perform proximate and Van Soest analyses to evaluate the nutritional value of feedstuffs.



CLO4: Formulate balanced rations for different species, including cattle, poultry, companion animals, swine, horses, and wildlife.

CLO5: Calculate the energy content of feeds accurately for both ruminants and non-ruminants.

CLO6: Design and conduct nutrition experiments using appropriate experimental design and statistical methods.

CLO7: Summarize and present laboratory findings effectively through systematic reviews, meta-analyses, and outcome presentations.

### 3. Plan of Action Consistent with Course-level Learning Outcomes:

Methods of organizing learning experiences to develop students and methods of assessing student learning that are consistent with the course-level learning outcomes.

CLOs	Methods of Organizing Learning Experiences (/)			Methods of Assessing Learning Outcomes (x)		
	Lecture	Laboratory	Individual Report Assignment	MCQ/MEQ Written Exam	Individual Report	Oral Presentation and Discussion
CLO 1	/			x		
CLO 2	/			x		
CLO 3		/			x	
CLO 4	/			x		
CLO 5		/			x	
CLO 6	/			x		
CLO 7			/		x	x



## Section 4: Teaching and Learning Evaluation Plan

### 1. Teaching Plan:

Week No.	Topic	Hour			Method	Instructor
		Lecture	Laboratory	Self-study		
1	Introduction to Applied Animal Nutrition	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Introduction to Laboratory Techniques		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
2	Nutrient Requirements	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Sampling and Sample Preparation		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
3	Digestive Processes in Animals	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Proximate Analysis - Moisture Content		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
4	Feed Composition and Analysis	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Proximate Analysis - Crude Protein		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
5	Measurement of Feed and Nutrient Utilization	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Proximate Analysis - Ether Extract (Crude Fat)		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot



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6	Ration Formulation Principles	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Proximate Analysis - Crude Fiber		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
7	Ration Formulation for Cattle	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Proximate Analysis - Ash Content		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
8	Ration Formulation for Poultry	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Van Soest Analysis - Neutral Detergent Fiber (NDF)		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
9	Ration Formulation for Companion Animals	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Van Soest Analysis - Acid Detergent Fiber (ADF)		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
10	Ration Formulation for Swine	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Van Soest Analysis - Lignin		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
11	Ration Formulation for Horses	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Feed Energy Calculation for Non-Ruminants		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
12	Ration Formulation for Wildlife	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot



	Feed Energy Calculation for Ruminants		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
13	Experimental Design and Statistics in Animal Nutrition Study 1	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Laboratory Summary 1		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
14	Experimental Design and Statistics in Animal Nutrition Study 2	2		5	Lecture, discuss, slide presentation	Assist. Prof. Dr. Surasak Jittakhot
	Laboratory Summary 2		3		Laboratory Practice	Assist. Prof. Dr. Surasak Jittakhot
15	Selected Systematic Review and Meta-Analysis Topic Presentation	2			Presentation	Assist. Prof. Dr. Surasak Jittakhot
	Laboratory Outcome Presentation		3		Presentation	Assist. Prof. Dr. Surasak Jittakhot
	Total	30	45	70		

## 2. Plan for Assessing Course-level Learning Outcomes (CLOs):

### 2.1 Measuring and Evaluating Learning Achievement:

#### a. Formative Assessment:

Assessment during the course to measure students' progress and learning development. This involves observing behavior, changes, and improvements in students' behavior and performance. Feedback is provided to students to help them consistently develop and improve themselves.

#### b. Summative Assessment:

##### (1) Tools and Weight for Measuring and Evaluating Outcomes:



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Learning Outcomes (CLOs)	Assessment Methods	Weight (%)
CLO1: Explain the principles of nutrient requirements and feed composition for various classes of livestock, horses, companion and wildlife animal.	MCQ/MEQ Written Exam	15
CLO2: Analyze and compare the digestive processes in ruminants and monogastric animals.	MCQ/MEQ Written Exam	15
CLO3: Perform proximate and Van Soest analyses to evaluate the nutritional value of feedstuffs.	Individual Report	5
CLO4: Formulate balanced rations for different species, including cattle, poultry, companion animals, swine, horses, and wildlife.	MCQ/MEQ Written Exam	15
CLO5: Calculate the energy content of feeds accurately for both ruminants and non-ruminants.	Individual Report	5
CLO6: Design and conduct nutrition experiments using appropriate experimental design and statistical methods.	MCQ/MEQ Written Exam	15
CLO7: Summarize and present laboratory results, and selected systematic reviews, meta-analyses, and lab outcome presentations.	Individual Report, Oral Presentation and Discussion	30
Total	-	100





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**Table Showing the Relationship Between Teaching Topics and CLOs:**

Learning Topics	Proportion of Assessment According to Course-level Learning Outcomes (CLOs)						
	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7
1. Introduction to Applied Animal Nutrition	5						
2. Introduction to Laboratory Techniques							
3. Nutrient Requirements	5						
4. Sampling and Sample Preparation							
5. Digestive Processes in Animals		10					
6. Proximate Analysis - Moisture Content							
7. Feed Composition and Analysis	5						
8. Proximate Analysis - Crude Protein							
9. Measurement of Feed and Nutrient Utilization		5					
10. Proximate Analysis - Ether Extract (Crude Fat)							
11. Ration Formulation Principles				3			
12. Proximate Analysis - Crude Fiber							
13. Ration Formulation for Cattle				2			
14. Proximate Analysis - Ash Content							
15. Ration Formulation for Poultry				2			
16. Van Soest Analysis - Neutral Detergent Fiber (NDF)							
17. Ration Formulation for Companion Animals				2			
18. Van Soest Analysis - Acid Detergent Fiber (ADF)							
19. Ration Formulation for Swine				2			
20. Van Soest Analysis - Lignin							
21. Ration Formulation for Horses				2			
22. Feed Energy Calculation for Non-Ruminants							



Learning Topics	Proportion of Assessment According to Course-level Learning Outcomes (CLOs)						
	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6	CLO7
23. Ration Formulation for Wildlife				2			
24. Feed Energy Calculation for Ruminants							
25. Experimental Design and Statistics in Animal Nutrition Study 1						7.5	
26. Laboratory Summary 1							
27. Experimental Design and Statistics in Animal Nutrition Study 2						7.5	
28. Laboratory Summary 2							
29. Selected Systematic Review and Meta-Analysis Topic Presentation							15
30. Laboratory Outcome Presentation & Report			5		5		15
Total (100)	15	15	5	15	5	15	30

**(2) Grading:**

A, B+, B, C+, C, D+, D, and F

**(3) Evaluation Criteria:**

The evaluation uses either a criterion-referenced or norm-referenced system in accordance with the Faculty of Veterinary Science, Mahidol University's grading policies. Grades are assigned as A, B+, B, C+, C, D+, D, and F. Students must receive a B or higher to pass.

**2.2 Grade Improvement or Retake Examination:**

If a student receives an F, and the course coordinator and the teaching committee deem it appropriate to allow a retake examination or additional work, the student must have a score of at least 47.50 for score sets with an average above 75.00, and at least 45.00 for score sets with an average between



60.00 and 74.99. For score sets with an average below 60.00, the student must have a score of at least 40.00 to be eligible for a retake examination or additional work. If the course coordinator considers the retake examination or additional work as "pass," the student's grade will be changed to D. During the period of retake examination or additional work, the student's grade will be temporarily marked as I (Incomplete).

### 3. Student Appeals:

If students have concerns, doubts, or wish to appeal regarding the organization of learning activities or the assessment of learning outcomes, they can submit a written request to the Education Administration Office of the Faculty of Veterinary Science. The request will be reviewed by the course coordinator. If the issue cannot be resolved, it will be forwarded to the teaching committee for further consideration. If necessary, the matter will be escalated to the Faculty's Education Complaint Committee for further investigation.

## Section 5: Learning Resources

### 1. Required Texts:

- Cheeke, P.R., 2005. Applied Animal Nutrition, Feed and Feeding, Third edition. Prentice-Hall, Inc, New Jersey. 676 pp.
- National Research Council, 1994. Nutrient Requirements of Poultry, Ninth Revised Edition. National Academy of Science/National Research.
- National Research Council, 2000. Nutrient Requirements of Beef Cattle, Seventh Revised Edition. National Academy of Science/National Research Council. Washington, NRC.
- National Research Council, 2001. Nutrient Requirements of Dairy Cattle, Seventh Revised Edition. National Academy of Science/National Research Council. Washington, NRC.
- National Research Council. 1994. Nutrient Requirements of Wild Animals. Washington, DC.
- National Research Council. 1998. Nutrient Requirements of Swine: 10th Revised Edition. Washington, DC: The National Academies Press.
- National Research Council. 2006. Nutrient Requirements of Dogs and Cats. Washington, DC.
- National Research Council. 1994. Nutrient Requirements of Wild Animals. Washington, DC.



National Research Council. 2007. Nutrient Requirements of Horses: Sixth Revised Edition. Washington, DC.

National Research Council. 2007. Nutrient Requirements of Small Ruminants: Sheep, Goats, Cervids, and New World Camelids. Washington, DC.

## 2. Suggested Resources:

<https://feedipedia.org>

## 3. Other Resources: (Applied Animal Nutrition Web-App Link for Learning Management)

<https://sites.google.com/mahidol.edu/applied-animal-nutrition/applied-animal-nutrition-vs-id-775>

## Section 6: Evaluation and Improvement of Course Implementation

### 1. Analysis and Evaluation of Course Implementation:

#### a. Data Used for Analysis

- Course evaluation forms (e-evaluation system)

#### b. Evaluation of Course Implementation Effectiveness (KPIs)

- Results of course evaluations (e-evaluation system)

### 2. Course Review and Improvement Planning:

Annual group meetings/course instructor meetings are held to plan the review and improvement of the course every academic year (June-July of each year).

### 3. Preparation of Course Self-Assessment Report:

MM5 form is submitted at the end of the course instruction and evaluation period.



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## Course Schedule

**Course Code:** VSID 775 **Course Title:** Applied Animal Nutrition

**Academic Year:** 2024, 1<sup>st</sup> semester

No.	Date	Time	Topic	Instructor
1	Aug 7, 2024	10.00-12.00 hr	Introduction to Applied Animal Nutrition	Assist. Prof. Dr. Surasak Jittakhot
	Aug 8, 2024	13.00-16.00 hr	Introduction to Laboratory Techniques	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
2	Aug 14, 2024	10.00-12.00 hr	Nutrient Requirements	Assist. Prof. Dr. Surasak Jittakhot
	Aug 15, 2024	13.00-16.00 hr	Sampling and Sample Preparation	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
3	Aug 21, 2024	10.00-12.00 hr	Digestive Processes in Animals	Assist. Prof. Dr. Surasak Jittakhot
	Aug 22, 2024	13.00-16.00 hr	Proximate Analysis - Moisture Content	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
4	Aug 28, 2024	10.00-12.00 hr	Feed Composition and Analysis	Assist. Prof. Dr. Surasak Jittakhot



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	Aug 29, 2024	13.00-16.00 hr	Proximate Analysis - Crude Protein	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
5	Sep 4, 2024	10.00-12.00 hr	Measurement of Feed and Nutrient Utilization	Assist. Prof. Dr. Surasak Jittakhot
	Sep 5, 2024	13.00-16.00 hr	Proximate Analysis - Ether Extract (Crude Fat)	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
6	Sep 11, 2024	10.00-12.00 hr	Ration Formulation Principles	Assist. Prof. Dr. Surasak Jittakhot
	Sep 12, 2024	13.00-16.00 hr	Proximate Analysis - Crude Fiber	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
7	Sep 18, 2024	10.00-12.00 hr	Ration Formulation for Cattle	Assist. Prof. Dr. Surasak Jittakhot
	Sep 19, 2024	13.00-16.00 hr	Proximate Analysis - Ash Content	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
	Sep 23 - Oct 4, 2024	-	Midterm Exam	-



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8	Oct 10, 2024	10.00-12.00 hr	Ration Formulation for Poultry	Assist. Prof. Dr. Surasak Jittakhot
	Oct 10, 2024	13.00-16.00 hr	Van Soest Analysis - Neutral Detergent Fiber (NDF)	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
9	Oct 16, 2024	10.00-12.00 hr	Ration Formulation for Companion Animals	Assist. Prof. Dr. Surasak Jittakhot
	Oct 17, 2024	13.00-16.00 hr	Van Soest Analysis - Acid Detergent Fiber (ADF)	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
10	Oct 24, 2024	10.00-12.00 hr	Ration Formulation for Swine	Assist. Prof. Dr. Surasak Jittakhot
	Oct 24, 2024	13.00-16.00 hr	Van Soest Analysis - Lignin	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
11	Oct 30, 2024	10.00-12.00 hr	Ration Formulation for Horses	Assist. Prof. Dr. Surasak Jittakhot
	Oct 31, 2024	13.00-16.00 hr	Feed Energy Calculation for Non-Ruminants	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul



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12	Nov 6, 2024	10.00-12.00 hr	Ration Formulation for Wildlife	Assist. Prof. Dr. Surasak Jittakhot
	Nov 7, 2024	13.00-16.00 hr	Feed Energy Calculation for Ruminants	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
13	Nov 13, 2024	10.00-12.00 hr	Experimental Design and Statistics in Animal Nutrition Study 1	Assist. Prof. Dr. Surasak Jittakhot
	Nov 14, 2024	13.00-16.00 hr	Laboratory Summary 1	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
14	Nov 20, 2024	10.00-12.00 hr	Experimental Design and Statistics in Animal Nutrition Study 2	Assist. Prof. Dr. Surasak Jittakhot
	Nov 21, 2024	13.00-16.00 hr	Laboratory Summary 2	Assist. Prof. Dr. Surasak Jittakhot Dr. Kunaporn Homyok Mrs. Samatchaya Vichajuthakul
15	Nov 27, 2024	10.00-12.00 hr	Selected Systematic Review and Meta-Analysis Topic Presentation	Assist. Prof. Dr. Surasak Jittakhot and Invited Staffs
	Nov 28, 2024	13.00-16.00 hr	Laboratory Outcome Presentation	Assist. Prof. Dr. Surasak Jittakhot and Invited Staffs
	<b>Dec 2-6, 2024</b>	-	<b>Final Exam</b>	-