



Academic degree level ☒ Bachelor ☐ Graduate Diploma ☐ Master

Program: Doctor of Veterinary Medicine

Course title Animal Nutrition

Course code VSPA 214.

☐ Higher Graduate Diploma ☐ Doctor

Faculty / College / Institute: Faculty of Veterinary Science

Department of Preclinic and Applied animal science

TQF 3 Course Specification

Section 1 General Information

1. Course Code and Title

In Thai สพปส ๒๑๔ โภชนศาสตร์สัตว์
In English VSPA 214 Animal Nutrition

2. Number of Credits

3 (2-3-5)
(Theory 2 hrs. Practice 3 hrs. Self-Study 5 hrs./week)

3. Curriculum and Course Type

3.1 Curriculum Bachelor Degree Program (Thai)
3.2 Course Type Specific Course ☒ Compulsory Course ☐ Electives

4. Course Coordinator and Lecturer

4.1 Course Responsible Lecturers

1. Asst. Prof. Dr. Surasak Jittakhot	Department of Preclinic and Applied animal science
Tel. 086-888-9352	E-mail : surasak.jit@mahidol.edu
2. Assistant Lecturer Koramit Jenjirawatn	Department of Preclinic and Applied animal science
Tel. 086-330-1115	E-mail : koramit.jen@mahidol.edu

4.2 Lecturers

1. Dr. Kunaporn Homyok	The Center for Veterinary Diagnosis
Tel. 081-810-8683	E-mail : kunaporn.hom@mahidol.edu
2. Samatchaya Pengdit	The Center for Veterinary Diagnosis
Tel. 087-680-4642	E-mail : samatchaya.pen@mahidol.edu
3. Assistant Lecturer Koramit Jenjirawatn	Department of Preclinic and Applied animal science
Tel. 086-330-1115	E-mail : koramit.jen@mahidol.edu
4. Asst. Prof. Dr. Surasak Jittakhot	Department of Preclinic and Applied animal science
Tel. 086-888-9352	E-mail : surasak.jit@mahidol.edu

5. Semester/Class Level

5.1 Semester 2 / Class Level 2
5.2 Number of Students Allowed Approximately 80 Students

6. Pre-requisite

VSPA 226 Integrated Veterinary Biochemistry

7. Co-requisites

None

8. Study Site Location

Faculty of Veterinary Science, Mahidol University

9. Date of Preparation/Latest Revision of the Course Specifications

24 June 2022

Section 2 Aims and Objectives

1. Course Goals

Course provides the knowledges for comparative gastro-intestinal (GI) tract in animals, digestive physiology, nutrient utilization, nutrient requirement, animal feed laboratory analysis, feed formulation by computerization, animal feeds and feeding for their production and its health integrity, basic production medicine practice for livestock and companion animals, animal nutrition research articles seminar.

Objectives /Goals of Course Management:

1. Explain from an instructor's intention in a broad perspective of principles, knowledge and skills related to the field of study and consider what skills the course responsible person aims to develop so that the learners can apply those skills for further studies and further careers (in correspondence with requirements at the program level).
2. Course goals will determine the course description accordingly.

2. Objectives of Course Development/Revision

2.1 Course Objectives

This course aims to provide knowledge and abilities as follows:

Students are able to

1. Describe the differences in digestive tract physiology and comparative nutrient utilization in ruminants and non-ruminants.

2. Define the principles of nutrient utilization and its requirement for water, electrolyte, carbohydrate, fat, protein, energy, mineral, vitamin, and nutritional disorders in animals.
3. Explain the principles of feedstuff selection, anti-nutritives in feedstuff and animal feed production system.
4. Formulate animal feed recipe using computerization and describe the feeding principles for maintenance, production and health integrity in animals.
5. Take sampling and analyze animal feed and feedstuff.
6. Search, understand, appraise, discuss and present for research articles in animal nutrition.

2.2 Course-level Learning Outcomes: CLOs

On completion of the course, the students will be able to

CLO1 Explain the differences in digestive tract physiology, nutrient utilization in ruminants and non-ruminants.

CLO2 Define the principles of nutrient utilization and requirement for water, electrolyte, carbohydrate, fat, protein, energy, mineral and vitamin.

CLO3 Describe nutritional disorders in animals.

CLO4 Categorize the principles of feedstuff selection, anti-nutritives in feedstuff, and animal feed production system.

CLO5 Formulate animal feed recipe by computerization and describe feeding principle for maintenance, production and health integrity in animals.

CLO6 Take sampling and analyze animal feed and feedstuff.

CLO7 Search, understand, appraise, discuss and present for research articles in animal nutrition.

Section 3 Course Description and Implementation

1. Course Description

โภชนศาสตร์สัตว์ โภชนาการและระบบการย่อยอาหารของสัตว์เปรียบเทียบ การจำแนกประเภทโภชนะและสุขภาพสัตว์ วัตถุประสงค์ อาหารสัตว์และการเลือกใช้ การประเมินการใช้ประโยชน์วัตถุดิบอาหารและโภชนะ การประเมินความต้องการโภชนะ ปัจจัยที่มีผลต่อการกินได้ สารยับยั้งการใช้โภชนะในอาหารสัตว์ มาตรฐานการให้อาหารและการให้ผลผลิต หลักการคำนวณและการสร้างสูตรอาหารในสัตว์ไม่เคี้ยวเอื้อง และเคี้ยวเอื้อง การเตรียมวัตถุดิบและการแปรรูปอาหารสัตว์ การควบคุมเชิงคุณภาพของโรงงานอาหารสัตว์ โรคทางโภชนาการ การวิเคราะห์คุณภาพทางเคมีของอาหารสัตว์ สัมมนางานวิจัยโภชนศาสตร์สัตว์

Animal nutrition, nutrition and comparative animal gastrointestinal tracts, nutrients classification and animal health; feedstuffs and its use, the determination of feeds and nutrient utilization, determination of animal nutrient requirements; factors affecting feed consumption, inhibitory factors in feedstuffs, nutritional disorders; feeding standard and productivity; feed formulation concept for non-ruminants and ruminants, feed preparation and processing, feed quality control of feed mills, nutritional diseases, feed proximate analysis, and animal nutrition research seminar.

The course description should reflect the course goals, and it is a concept-based description instead of a teaching topic to facilitate the flexibility of adjusting the lesson plan to keep pace with changes.

2. Number of hours per semester

Theory (hours)	Practice (hours)	Self-study (hours)
30	45	75

3. Number of Hours per Week for Individual Advice

Students are anticipated to contract via course responsible lecturer for advised 1 hour per week

Section 4: Development of the expected learning outcomes

1. A brief summary of the knowledge or skills expected to develop in students; the course-level expected learning outcomes (CLOs)

On completion of the course, students will be able to:

1. CLO1 Explain the differences in digestive tract physiology, nutrient utilization in ruminants and non-ruminants.
2. CLO2 Define the principles of nutrient utilization and requirement for water, electrolyte, carbohydrate, fat, protein, energy, mineral and vitamin.
3. CLO3 Describe nutritional disorders in animals.
4. CLO4 Categorize the principles of feedstuff selection, anti-nutritives in feedstuff, and animal feed production system.
5. CLO5 Formulate animal feed recipe by computerization and describe feeding principle for maintenance, production and health integrity in animals.
6. CLO6 Take sampling and analyze animal feed and feedstuff.
7. CLO7 Search, understand, appraise, discuss and present for research articles in animal nutrition.

2. How to organize learning experiences to develop the knowledge or skills stated in number 1 and how to measure the learning outcomes

CLOs	Teaching and learning experience management			Learning outcomes measurements			
	Lecture	Laboratory practice	Group work	MCQ	Group reports	Individual reports	Practice examination
CLO1	/			/			
CLO2	/			/			
CLO3	/			/			
CLO4	/			/			
CLO5		/		/		/	/
CLO6		/		/	/	/	
CLO7			/		/		

SECTION 5 LESSON PLAN AND EVALUATION

1. Lesson Plan

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
1	Introduction in principle of animal nutrition.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Introduce material and instrument in animal nutrition laboratory.		3:00	Laboratory practice/ Individual reports/ Group report/ Handout	All staff
2	Comparative digestive tract physiology in non-ruminant species. Digestive tract physiology in ruminant species.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Feedstuff and sample preparation for laboratory analysis.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
3	Nutrition of water and electrolyte and its disorders in animals.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Precision and accuracy in laboratory analysis result.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
4	Nutrition of carbohydrate and fat and its disorders in animals.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Moisture analysis in animal feed and feedstuff.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
5	Nutrition of protein and its disorders in animals.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Ash analysis in animal feed and feedstuff.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
6	Nutrition of energy and its disorders in animals.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Nitrogen and protein analysis in animal feed and feedstuff.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
7	Nutrition of vitamin and mineral and its disorders in animals.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Crude fat analysis in animal feed and feedstuff.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
8	Feedstuff selection, anti nutritive in feedstuff and animal feed production process.	2:00		Lecture/ Slide Presentation/ Handout	Asst. Prof. Dr. Surasak
	Crude fiber analysis in animal feed and feedstuff.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
9	Nutrition, feed formulation and feeding in dairy cattle.	2:00		Lecture/ Slide Presentation/ Handout	Assistant Lecturer Koramit
	Detergent fiber analysis in animal feed and feedstuff.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
10	Nutrition, feed formulation and feeding in beef cattle.	2:00		Lecture/ Slide Presentation/ Handout	Assistant Lecturer Koramit
	Calculation energy in animal feed and feedstuff.		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
11	Nutrition, feed formulation and feeding in horse.	2:00		Lecture/ Slide Presentation/ Handout	Assistant Lecturer Koramit
	Fatty acid profile analysis in animal feed and feedstuff by Gas Chromatography (GC).		3:00	Group work/ Group report/ Individual report/ Workshop	All staff
12	Nutrition, feed formulation and feeding in swine.	2:00		Lecture/ Slide Presentation/ Handout	Assistant Lecturer Koramit
	Amino acid profile analysis in animal feed and feedstuff by High Performance Liquid Chromatography (HPLC).		3:00	Group work/ Group report/ Presentation	All staff

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
13	Nutrition, feed formulation and feeding in poultry.	2:00		Lecture/ Slide Presentation/ Handout	Assistant Lecturer Koramit
	Mineral profile analysis in animal feed and feedstuff by Atomic Absorption Spectrophotometer (AAS).		3:00	Group work/ Group report/ Presentation	All staff
14	Nutrition, feed formulation and feeding in aquatic and companion animal.	2:00		Lecture/ Slide Presentation/ Handout	Assistant Lecturer Koramit
	Group laboratory result analysis.		3:00	Group work/ Group report/ Presentation	All staff
15	Group laboratory result discussion.	2:00		Lecture/ Slide Presentation/ Handout	All staff
	Seminar group work presentation.		3:00	Group work/ Group report/ Presentation	All staff
	Total hours of the entire semester	30:00	45:00		

2. Plan for Assessment of Expected Course-Level Learning Outcomes (CLOs)

2.1 Measurement and Evaluation of learning achievement

A. Formative Assessment

The assessment is performed during the course to measure the progress and development of students' learning by observing the behavior change and improvement of students' behavior and performance. The assessment results will be notified to the students (feedback) so that the students are constantly able to improve themselves. The assessment results are not included with the test scores at the end of the course.

B. Summative Assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes	Evaluation Method*				Weight (Percentage)
	MCQ	Group re- ports	Individual re- ports	Practice ex- amination	
CLO1 Explain the differences in digestive tract physiology, nutrient utilization in ruminants and non-ruminants.	8				8
CLO2 Define the principles of nutrient utilization and requirement for water, electrolyte, carbohydrate, fat, protein, energy, mineral and vitamin.	21				21
CLO3 Describe nutritional disorders in animals.	21				21
CLO4 Categorize the principles of feedstuff selection, anti-nutritives in feedstuff, and animal feed production system.	5				5
CLO5 Formulate animal feed recipe by computerization and describe feeding principle for maintenance, production and health integrity in animals.	5			20	25
CLO6 Take sampling and analyze animal feed and feedstuff.	5	5	5		15
CLO7 Searching understanding analyzing presenting and discuss research in animal nutrition topic.		5			5
รวม	65	10	5	20	100

(2) Measurement and evaluation

The measurement and evaluation use either the criteria-based or group-based system, according to the conditions and methods for academic results evaluation of the Faculty of Veterinary Science, Mahidol University. The grading symbols are: A, B+, B, C+, C, D+, D, and F. Students must receive a 'D' grade or above to pass the criteria.

(3) Re-examination (if the course allows any.)

In case that students received an 'F' grade, the course coordinator and the program's Teaching and Learning Development Committee should, altogether, agreed to allow the students to take the re-examination or extra-course work to pass the course with the following conditions.

For the course with the mean score is higher than 75.00 and the minimum score is not less than 45.00. Students must receive the score higher than 47.50 to take to re-examination or extra-course work.

For the course with the mean score between 60.00 – 74.99, students must receive the score higher than 40.00. However, when the mean score is less than 60.00, students, then, should receive the score higher than 40.00 in order to take the re-examination or extra-course work.

Once students took the re-examination (extra-course work) and the course coordinator had considered the students' re-examination/course work to pass the criteria, then the students will receive the 'D' grade. While waiting for the re-examination or extra-course work result, the students' score should be indicated as 'I' grade.

3. Students' Appeal

Should the students have any suspicion or appeals to the teaching and learning activities and the grade assessment, students could make the appeal by filling in the form at MUVS' Academic Affairs. The appeal will be proposed to the course coordinator to consider the request. If the appeal could not be addressed at this point, it will be further process by the program's Teaching and Learning Development Committee. In case that the committee suggested further investigation should be done, the appeal will be purposed to the faculty's appealing committee to address the issue.

Section 6 Teaching Resources

1. Required Texts

1. Chiba, L.I. 2009. Animal nutrition handbook. Second edition. Academic Publishing Press, California. 548pp.
2. Ensminger, M.E., Oldfield, J.E. and Heinemann. 1990. Feeds and Nutrition. Second edition. Ensminger Publishing Co., California. 1554pp.
3. McDonald, P., Edwards, R.A., Greenhalgh, J.F.D., and Morgan, C.A. 2002. Animal Nutrition, Sixth edition. Ashford Colour Press Ltd, Gosport. 693pp.

4. Naylor, J.M and Ralston, S.L. 1991. Large animal clinical nutrition. Mosby-Year Book, Inc. Missouri. 576pp.
5. Perry, T.W., Cullison, A.E. and Lowrey, R.S. 1999. Feeds and Feeding, fifth edition. Prentice-Hall inc, New Jersey. 676pp.
6. Pond, W.G., Church, D.C. and Pond, K.R. 1995. Basic animal nutrition and feeding. John Wiley & Sons, Inc., New York. 615pp.

2. Suggested Materials

1. National Research Council, 2001. Nutrient Requirements of Dairy Cattle, Seventh Revised Edition. National Academy of Science/National Research Council. Washington, NRC.
2. National Research Council, 2000. Nutrient Requirements of Beef Cattle, Seventh Revised Edition. National Academy of Science/National Research Council. Washington, NRC.
3. National Research Council, 1985. Nutrient Requirements of Sheep, Sixth Revised Edition. National Academy of Science/National Research Council. Washington, NRC.
4. National Research Council, 1994. Nutrient Requirements of Poultry, Ninth Revised Edition. National Academy of Science/National Research Council. Washington, NRC.
5. National Research Council, 1998. Nutrient Requirements of Swine, Tenth Revised Edition. National Academy of Science/National Research Council. Washington, NRC.
6. National Research Council, 1989. Nutrient Requirements of Horses, Fifth Revised Edition. National Academy of Science/National Research Council. Washington, NRC.

1. Other Resources (if any)

<https://www.feedipedia.org>

<https://www.feedtables.com>

<https://www.nutritionvalue.org>

<https://www.msdivetmanual.com>

Section 7 Evaluation and Improvement of Course Implementation

1. Strategy for Course Effectiveness Evaluation by Students

At the end of each course, it is required for the students to assess the teaching of each instructor based on the following criteria: punctuality, good role model, application of morals and ethics for the instruction, ability to convey knowledge and encourage students to learn, giving opportunities for students to ask questions and to comment during the study.

The overall outcomes of each course will also be assessed by the students for the following issues: the instructor's knowledge and competency, the course's effectiveness, student's satisfaction with the study, and other comments from students. The evaluation is conducted through online platform.

2. Strategy for Teaching Evaluation

The instructors or the course coordinators are assigned to conduct the evaluation as follows.

2.1 the students' evaluation for the instruction and overall outcomes of the course in accordance to criteria mentioned in No. 1 – Strategy for Course Effectiveness by Students.

2.2 The instructors must perform self-assessment for the following criteria.

- (1) Appropriate time spent to prepare for the teaching.
- (2) The instructor's satisfaction with the teaching results.
- (3) Solutions or recommendations for the program's teaching improvement or self-improvement for the next class/academic year.

3. Teaching Improvement

Prior to each academic year, there are meetings/seminars for the instructors of each course to plan to improve the course's teaching and learning management based on the following information.

- (1) the students' academic performance
- (2) the students' evaluation results
- (3) the instructors' assessment results

4. Verification of Standard of Learning Outcome for the Course

The verification of the standard of the Learning Outcome for the Course is conducted by the course coordinators based on the following aspects.

1. The goals of the learning outcomes are clear and feasible.
2. The learning experience is aligned with the expected goals.
3. The learning experience encourages the students to research and practice self-learning skills.
4. The evaluation methods are appropriate to assess the expected goals and learning experience.
5. The program applied the educational theory and the results from the previous evaluation to plan for improvement.

At the end of each academic year, the course coordinators, instructors, the Program Committee, and the Teaching and Learning Development Committee will consider the assessment results and the Learning Outcome for the Course to plan for the improvement of the next academic year.

Appendix

Relations between the course and the program

Table 1 Relations between the course and the PLOs

Course Name	PLOs							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
Animal Nutrition (Course Code) VSPA 214	R		R		R,P	R,P		

Remarks: Show the level of the course management with the symbols I, R, P, and M. This must correspond to the curriculum mapping written in the TQF2

Table 2 Relations between CLOs and PLOs

(Course Code) VSPA 210	PLOs							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1 Explain the differences in digestive tract physiology, nutrient utilization in ruminants and non-ruminants.	R							
CLO2 Define the principles of nutrient utilization and requirement for water, electrolyte, carbohydrate, fat, protein, energy, mineral and vitamin.	R		R					
CLO3 Describe nutritional disorders in animals.	R		R					

CLO4 Categorize the principles of feedstuff selection, anti-nutritives in feedstuff, and animal feed production system.	R		R					
CLO5 Formulate animal feed recipe by computerization and describe feeding principle for maintenance, production and health integrity in animals.			R			R,P		
CLO6 Take sampling and analyze animal feed and feedstuff.			R		R,P			
CLO7 Search, understand, appraise, discuss and present for research articles in animal nutrition.					R			