



Program: Doctor of Veterinary Medicine
Course title Integrated Veterinary Biochemistry
Course code VSPA 226

Academic degree level ☒ Bachelor ☐ Graduate Diploma ☐ Master

☐ Higher Graduate Diploma ☐ Doctor

Faculty / College / Institute: Faculty of Veterinary Science
Department of Pre-clinic and Applied Animal Science

TQF 3 Course Specification

Section 1 General Information

1. Course Code and Title

In Thai สพปส ๒๒๖ บูรณาการชีวเคมีทางการแพทย์
In English VSPA 226 Integrated Veterinary Biochemistry

2. Number of Credits 2 (2-0-4)

(Theory 2 hrs. Practice 0 hrs. Self-Study 4 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

4.11 Assist. Prof. Boonrat Chantong Department of Pre-clinic and Applied Animal Science
Telephone Number 081-684-8882 e-mail address: boonrat.cha@mahidol.edu
4.12 Assoc. Prof. Shutipen Buranasinsup Department of Pre-clinic and Applied Animal Science
Telephone Number 089-6104954 e-mail address: shutipen.bur@mahidol.edu

4.2 Lecturers

4.21 Assist. Prof. Boonrat Chantong Department of Pre-clinic and Applied Animal Science
Telephone Number 081-684-8882 e-mail address: boonrat.cha@mahidol.edu
4.22 Assoc. Prof. Shutipen Buranasinsup Department of Pre-clinic and Applied Animal Science
Telephone Number 089-6104954 e-mail address: shutipen.bur@mahidol.edu
4.23 Assist. Prof. Waraphan Toniti Department of Pre-clinic and Applied Animal Science
Telephone Number 081-487-6173 e-mail address: waraphan.ton@mahidol.edu
4.24 Assoc. Prof. Sivapong Sungpradit Department of Pre-clinic and Applied Animal Science
Telephone Number 080-234-3659 e-mail address: sivapong.sun@mahidol.edu
4.25 Assist. Prof. Paranee Yatmark Department of Pre-clinic and Applied Animal Science
Telephone Number 081-856-7181 e-mail address: paranee.yat@mahidol.edu
4.26 Dr. Kripitch Sutummaporn Department of Pre-clinic and Applied Animal Science
Telephone Number 089-673-8490 e-mail address: kripitch.sut@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 224 Veterinary Biochemistry

VSPA 225 Laboratory of Veterinary Biochemistry

7. Co-requisites

-

8. Study Site Location Faculty of Veterinary Science, Mahidol University

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

Day 15 Month June Year 2022

Section 2 Aims and Objectives

1. Course Goals

Organize experience-based learning for students to contribute to the explanation of metabolism concepts including thermodynamic, respiratory chain and oxidative phosphorylation, the metabolism of carbohydrate, lipid, nitrogenous compound, nucleic acid, the control of metabolism, and the integration of frontier knowledge of veterinary biochemistry.

2. Objectives of Course Development/Revision

2.1 Course Objectives

This course aims to provide knowledge and abilities as follows:

1. Understanding and describing the basis of thermodynamic, electron transport chain, and oxidative phosphorylation
2. Understanding the principles of carbohydrate, lipid, nitrogenous chemical, and DNA metabolism
3. Understanding metabolism regulation

2.2 Course-level Learning Outcomes: CLOs

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

1. CLO1 Describe the basis of thermodynamic, electron transport chain, and oxidative phosphorylation
2. CLO2 Describe the principles of carbohydrate, lipid, nitrogenous chemical, and DNA metabolism
3. CLO3 Describe the interrelationship among metabolism as well as its regulation

4. CLO4 Integration of current veterinary biochemistry knowledge

Section 3 Course Description and Implementation

1. Course Description

อุณหพลศาสตร์ โഴ้การขนส่งอิเล็กตรอนและออกซิเดทีฟฟอสโฟริเลชัน กระบวนการเมแทบอลิซึมของคาร์โบไฮเดรต ไขมัน สารประกอบไนโตรเจน ดีเอ็นเอ ความสัมพันธ์ และกระบวนการควบคุมเมแทบอลิซึม บูรณาการองค์ความรู้ใหม่เกี่ยวกับชีวเคมีทางสัตวแพทย์

Thermodynamics, electron transport chain, oxidative phosphorylation; metabolism of carbohydrate, lipid, and nitrogenous compounds; DNA, the integration and regulation of metabolisms, the integration of veterinary biochemistry knowledge

2. Number of hours per semester

Theory (hours)	Practice (hours)	Self-study (hours)
30	0	60

3. Number of Hours per Week for Individual Advice

1 hour/week (only on Wednesday)

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 Describe the basis of thermodynamic, electron transport chain, and oxidative phosphorylation
2. CLO2 Describe the principles of carbohydrate, lipid, nitrogenous chemical, and DNA metabolism
3. CLO3 Describe the interrelationship among metabolism as well as its regulation.
4. CLO4 Integration of current veterinary biochemistry knowledge

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	seminar	presentation	self study		MCQ	presentation	assignments	
CLO1	x	x	x	x		x	x	x	
CLO2	x	x	x	x		x	x	x	
CLO3	x	x	x	x		x	x	x	
CLO4		x	x	x			x	x	

SECTION 5 LESSON PLAN AND EVALUATION

1. Lesson Plan

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
1	Bioenergetics and principle of metabolism I	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Waraphan
2	Bioenergetics and principle of metabolism II Metabolism of carbohydrate I	1 1	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Waraphan Assist. Prof. Boonrat
3	Metabolism of carbohydrate II	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Boonrat
4	Metabolism of carbohydrate III	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Boonrat
5	Metabolism of carbohydrate IV	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Boonrat
6	Metabolism of lipid I	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Boonrat
7	Metabolism of lipid II	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Boonrat
8	Metabolism of lipid III	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Boonrat
9	Metabolism of nitrogenous compound I	2	-	Lecture: ppt, online lessons, group discussion	Assoc. Prof. Shutipen

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
10	Metabolism of nitrogenous compound II	2	-	Lecture: ppt, online lessons, group discussion	Assoc. Prof. Shutipen
11	Metabolism of nucleotide I	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Waraphan
12	Metabolism of nucleotide II Relation and regulation of metabolism I	1 1	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Waraphan Assist. Prof. Boonrat
13	Relation and regulation of metabolism II	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Boonrat
14	Integration of frontier biochemical knowledges I	2	-	Lecture: ppt, online lessons, group discussion	Assist. Prof. Waraphan Assist. Prof. Boonrat
15	Integration of frontier biochemical knowledges II	2	-	Lecture: ppt, online lessons, group discussion	Assoc. Prof. Shutipen Assoc. Prof. Sivapong Assist. Prof. Paranee Dr. Kripitch
	Total hours of the entire semester	30	-		

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	Assign- ment	Individual work presentation	..xx..	
CLO1 Describe the basis of thermodynamic, electron transport chain, and oxidative phosphorylation	13	2			15
CLO2 Describe the principles of carbohydrate, lipid, nitrogenous chemical, and DNA metabolism	56	4			60
CLO3 Describe the interrelationship among metabolism as well as its regulation	13	2			15
CLO4 Integration of current veterinary biochemistry knowledge	3	7			10
รวม	85	15			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 processed 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) Kaneko JJ, Harvey JW, Bruss ML, editors. Clinical biochemistry of domestic animals. Academic press; 2008 Sep 4.
- 2) Kerr MG. Veterinary laboratory medicine: clinical biochemistry and haematology. John Wiley & Sons; 2008 Apr 15.
- 3) Nelson DL and Cox MM. Lehninger Principles of biochemistry 7th ed. New York: W.H. Free man and company; 2017.
- 4) Rodwell V, Bender D, Botham KM, Kennelly PJ, Weil PA. Harpers illustrated biochemistry 30th edition. McGraw Hill Professional; 2015 Mar 22.
- 5) Boyer RF. Concepts in biochemistry. Wiley; 2006.

2. Suggested Materials

- 1.1 Ingvarstsen KL, Andersen JB. Integration of metabolism and intake regulation: a review focusing on periparturient animals. Journal of dairy science. 2000 Jul 1;83(7):1573-97.
- 1.2 Meijer AJ, Dubbelhuis PF. Amino acid signalling and the integration of metabolism. Biochemical and biophysical research communications. 2004 Jan 9;313(2):397-403.

- 1.3 Schropp DM, Kovacic J. Phosphorus and phosphate metabolism in veterinary patients. *Journal of Veterinary Emergency and Critical Care*. 2007 Jun;17(2):127-34.

3. Other Resources (if any)

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 Integrated Veterinary Biochemistry (Course Code) VSPA 226	PLOs							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
	R				R			

Table 2 Relations between CLOs and PLOs

VSPA226	PLOs							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1 Describe the basis of thermodynamic, electron transport chain, and oxidative phosphorylation	1.2							

CLO2 Describe the principles of carbohydrate, lipid, nitrogenous chemical, and DNA metabolism	1.2							
CLO3 Describe the interrelationship among metabolism as well as its regulation.	1.2							
CLO4 Integration of current veterinary biochemistry knowledge	1.2				5.2 5.4			