Doctor of Philosophy Program
in Bioscience for Sustainable Agriculture
(International Program/New Program 2015)

Graduate School

Table of contents

Doctor of Philosophy Program in Bioscience for Sustainable Agriculture (International Program/New Program 2015)

Institute Silpakorn University
Campus/Faculty/Department Phetchaburi IT Campus, Graduate School

Section 1 General Information

1. Program title

Thai หลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาชีววิทยาศาสตร์เพื่อเกษตรกรรมที่ยั่งยืน (หลักสูตรนานาชาติ)

English Doctor of Philosophy Program in Bioscience for Sustainable Agriculture (International Program)

2. Degree title

Doctor of Philosophy (Bioscience for Sustainable Agriculture)
Ph.D. (Bioscience for Sustainable Agriculture)

3. Major field (if any)

None

4. Total of graduate credits

Plan 1.1		48	credits
Plan 1.2		72	credits
Plan 2.1	not less than	48	credits
Plan 2.2	not less than	72	credits

5. Program format

5.1 Format: Doctor of Philosophy Program
Plan 1.1: 3-year program
Plan 1.2: 5-year program
Plan 2.1: 3-year program
Plan 2.2: 5-year program

5.2 Language: English

5.3 Admission: Thai and foreign students

5.4 Collaboration with other institute: The program is administered solely by Silpakorn University.

5.5 Degree awarded: Degree in Bioscience for Sustainable Agriculture

6. Program status program permission/approval

New program for 2015. Instruction begins in the second semester of Academic Year 2015
The University Academic Committee granted program approval at Meeting Number 4/2557 Date 1 Month May Year 2014
The University Council granted program permission at Meeting Number 11/2558 Date 11 Month November Year 2015

7.Dissemination of quality and standardized program timeframe

Academic Year 2016

8. Post-graduation occupations

1. Lecturer in public universities
2. Researcher and scientist in government section or research institutes
3. Researchand development scientist in private corporations
4. Owner of farms including livestock such as swine, poultry, cattle, owner of crop production such as plant tissue culture, flower garden, and integrated agricultural farming
5. Consultant in international agricultural organization

9. Name, I.D. Number, title and degree of the person in charge of the curriculum

1. Mr. Narin Preyavichyapugdee

Position	Lecturer
Qualification	Ph.D. (Pathobiology) Mahidol University (2007)
	D.V.M., Kasetsart University (1995)

2. Miss. Chanjira Sitthiya

Position	Lecturer
Qualification	Ph.D. (Animal Science) Ehime University, Japan (2015)
	M.Sc. (Animal Science) Kagawa University, Japan (2012)
	B.Sc. MaeJo University (2005)

3. Mr. Attapol Tiantong

Position	Lecturer
Qualification	Ph.D. (Animal Science) National Chung Hsing University, Taiwan (2015)
	B. Sc. (Animal Science) Maejo University (2552)

10. Place of instruction

Faculty of Animal Sciences and Agricultural Technology, SilpakornUniversity, Phetchaburi IT Campus

1 Moo 3 Sampraya, Cha-am, Phetchaburi.

11. External situation or important development considered for program planning

11.1 Economic situation or development

At the present time countries all over the world acknowledges the importance of biological resources and regards biological resources as an essential entity for national development. Thailand as a country, which is rich in biological diversity, is in a position to utilize these rich biological resources in a sustainable manner. The curriculum for PhD. students is thus essential for producing highly capable personnel who will subsequently create new knowledge and appropriate technology to effectively capitalize these rich biological resources

11.2 Socio-cultural situation and development

It is well known that populace in the world particularly in the developed countries has recognized the importance of quality of environment, health and food for consumption. The biological resources can be utilized to maintain environmental quality, to produce drugs for human and animal and to produce safe quality food for consumption. The end result of using such biological resources effectively will ensure that the society has been sustainably developed.

12. The effects mentioned in no.11 on curriculum development and its relevance to the mission of the university/institute

12.1 Program development

The current curricular development requires proactive approach to respond to the society and the forth coming competitive environment. This curriculum aims to produce highly trained researchers who are capable of inventing research works not only needed by the countries and the changing world but also accepted by the international standard. All these needs can be achieved by the university which has a mission to develop new curriculum and has a capacity to execute its mission according to its objective.

12.2 Its relevance to the missions of the university/institute

The impact from the outside or the social and cultural development to the mission of the university which aims for academic excellence means that the university must produce graduate with ethic. The curricular development must emphasize on producing postgraduate personnel who possess academic capability, ethical and social acceptance, ability to conduct research to create new knowledge and ability to transfer this knowledge for developing the community, the society and the nation.

13. Cooperation with other curricula of the university (if any).

None

Section 2 Program's Specific Information

1. Philosophy, justification and objectives of the curriculum

1.1 Philosophy

To create personnel in agriculture with the capability to use scientific process, in combination with local wisdom and with the emphasis in the conservation of nature and environment, for the sustainability in agriculture.

1.2 Justification

Thailand has a solid foundation in agriculture with the majority of the people engaging in agricultural occupations. There are many industries which require raw materials from agricultural productivity. Thailand also has rich biological diversity in term of aquatic and terrestrial animals as well as plants. All these organisms can be utilized for economic and social development in a sustainable manner.

The Royal Thai government has set the year 2012-2021 for human resource development both in term of research and technology with the aim to increase the competitive capability of Thailand in the world arena. The Royal Thai government also aims to set Thailand as a knowledge hub in South East Asia as Thailand possesses various agencies which contain highly trained personnel in managing and researching in biological science to drive this policy.

Moreover, it has been reported that there are more than 200 private companies engaging in business related to biological technology. These companies have a marketing value of more than US$ 2 billion. It has been anticipated that business related to biological technology will enormously expand in the near future.

Faculty of ASAT - locating in the area which has been developed under His Majesty the King Royal Projects (such as the Sirindhorn International Environment Park, "Chang-Hua-Mun" Royal Initiative Project and the King Royally Initiated Laem Phak Bia Environmental Research and Development Project) - is thus in a suitable position to produce graduates who are capable of solving agricultural problems using the theory of sufficient economy.

The reason stated above indicates that there is a demand for highly trained personnel who are needed in the job related to biological technology. To conform to the government policy and to cater the demand from the private sector, Faculty of ASAT has initiated the curriculum Doctor of Philosophy Program in Bioscience for Sustainable Agriculture (International Program/New Program 2015) to produce graduates who are capable of producing new knowledge for sustainable agriculture. This is to solve the problems in agriculture sustainably based upon scientific process and modern technology.

Faculty of ASAT aims to implement this curriculum for the benefit of the agriculturist in Thailand and other ASAEN members as Cambodia, Indonesia, Laos, Myanmar and Vietnam. With the same line of agricultural development with Thailand, this curriculum will be used as a tool to develop human resources.

1.3 Objectives

1.3.1 To produce a holder of doctor of philosophy's degree capable to generate new knowledge and capable to initiate a research program based upon sustainable agriculture that suitable for working in university, college or other institutes both in the public and private sectors.

1.3.2 To produce research in the field of Bioscience for Sustainable Agriculture for disseminated in the international level.

1.3.3 To accommodate the national and international government and private sector's effort in the development of human resource to enhance the strength of science and technologyfor sustainable agriculture.

2. Plan for development and improvement

Plan for development/revision	Strategies	Indexes
Revise the program in accordance with the minimum standard specified by OHEC within 5 years	1. Prepare course details according to TQF3 2. Prepare report of course operation outcome according to TQF5 3. Prepare report of program operation outcome according to TQF7	1.TQF3 of all courses 2. TQF5 of all courses 3. Annual TQF7
Revise the program to keep it updated and consistent with the labor market demand within 5 years	Evaluate the program from its operation, instruction management, organization and operator demand, and graduate employment	The program's evaluation outcome report
Plan to utilize research results within 4 years	Disseminate instructor's and students' research results and academic works	Disseminated articles or presentation of research results

Section 3 Educational Management System, Curriculum Implementation and Structure

1. Educational Management System

1.1 System

Bi-semester instructional system. All regulations are in accordance with Silpakorn University's Regulations on Graduate Study B.E.2550 (2007).

1.2 Summer session

Summer courses are available based on the Program Committee's judgment.

1.3 Credit equivalent to semester system

None

2. Program Implementation

2.1. Instruction Period

Semester 1	August – December
Semester 2	January – May
Summer	June – August

2.2. Student qualifications

2.2.1 Student qualifications according to study plan

Plan 1.1 Graduates of Master Degree or equivalent in agricultural science, biological science, or related fields with excellent academic record or with the decision and consent of the curricular academic committee

Plan 1.2 Graduates of Bachelor Degree in agricultural science, biological science, or related fields with excellent academic record and consent of the curricular academic committee

Plan 2.1 Graduates of Master Degree in agricultural science, biological science, or related fields with an equivalent GPA of 3.00 or higher or with the decision and consent of the curricular academic committee

Plan2.2 Graduates of Bachelor Degree in agricultural science, biological science, or related fields with excellent academic record and consent of the curricular academic committee

2.2.2 Eligible candidates under Clause 2.2.1 must have all the qualifications specified in Clause 7 of Silpakorn University's Regulation on Graduate Study B.E. 2550 (2007) (and/or its revised version).

2.2.3 The eligible candidate for this curriculum must pass the English test as stipulated by Silpakorn University Regulation 2007 or other similar standards. The result of

the test should not exceed 2 years prior to the admission to study. The curricular academic committee shall consider temporarily waiving the English test on the case by case basis.

2.2.4 Candidates who do not meet the qualification in 2.2.1 must have their cases considered by the program committee and the Dean of Graduate School.

2.3 Problems of incoming students

The students also require intensive training to elevate their English proficiency to study in this curriculum.

2.4 Strategies to solve problems in No.2.3

The students will be provided with intensive training for improving both their writing and their communication skills in English so that they are ready to engage in the learning process of this curriculum.

2.5. Admission plan and graduation projection in the next 5 years

2.5.1 Plan 1.1 and 1.2

Academic Year	Number of Students				
	2015	2016	2017	2018	2019
Year1	5	5	5	10	10
Year2	-	5	5	10	10
Year 3	-	-	5	5	10
Total	5	10	15	20	25
Number of expected graduates	-	-	5	5	5

2.5.2Plan 2.1 and 2.2

Academic Year	Number of Students				
	2015	2016	2017	2018	2019
Year1	2	2	2	5	5
Year2	-	2	2	2	5
Year3	-	-	2	2	2
Year4	-	-	-	2	2
Year5	-	-	-	-	2
Total	2	4	6	11	16
Number of expected graduates	-	-	-	-	5

2.6 Planned Budgets

2.6.1Revenue Budget

2.6.1.1 Revenue Budget (Unit : Baht)

Revenue Budget	Fiscal Year				
	2015	2016	2017	2018	2019
Tuition fee	35,000	70,000	105,000	155,000	205,000
Registration fee*	490,000	980,000	1,470,000	2,170,000	2,870,000
Government budjet	-	-	-	-	-
Total	525,000	1,050,000	1,575,000	2,325,000	3,075,000

Thai students must pay the registration fee at 30,000 baht/semester

Foreign students must pay the registration fee at 60,000 baht/semester

*Registration fee is calculated by using the average registration fee of Thai and foreign students.

2.6.2 Expenditure budget

2.6.2.1Expenditure budget (Unit : Baht)

Expenditure	Fiscal year				
	2015	2016	2017	2018	2019
A.Administrative budget					
1. Personnel expenditure	126,000	252,000	378,000	558,000	738,000
2. Administrative expenditure	84,000	168,000	252,000	372,000	492,000
3. Scholarship	42,000	84,000	126,000	186,000	246,000
4. Expense for University level	63,000	126,000	189,000	279,000	369,000
Total (A)	315,000	630,000	945,000	1,395,000	1,845,000
B. Investment budget					
Cost for hardware	105,000	210,000	315,000	465,000	615,000
Total (B)	105,000	210,000	315,000	465,000	615,000
Total (A) + (B)	420,000	840,000	1,260,000	1,860,000	2,460,000
Total students	7	14	21	31	41
Total cost per one student (4 semesters)	60,000	60,000	60,000	60,000	60,000

2.7 Educational systems

☑ Classroom

☐ Distance learning through the primary source of printed media

☐Distance learning through the primary source of audio-visual media

☐ Distance learning through the primary source of E-learning media

☐ Distance learning through the primary source of Internet media

☐ Other (please specify)

2.8 Transfer of credits, courses and cross university registration (If any)

In accordance with Silpakorn University's Regulation on Graduate Study B.E. 2550 (2007)

3. Curriculum and Lecturers

3.1 Curriculums

3.1.1 Number of credits

Plan 1.1		48	credits
Plan 1.2		72	credits
Plan 2.1	not less than	48	credits
Plan 2.2	not less than	72	credits

3.1.2 Curriculum Structure

Plan 1.1		**48**	**credits**
Seminar		3	credits*
Thesis	(equivalent to)	48	credits
Plan1.2		**72**	**credits**
Seminar		6	credits *
Thesis	(equivalent to)	72	credits
Plan2.1		**48**	**credits**
Required courses		6	credits
Elective courses	not less than	6	credits
Thesis	(equivalent to)	36	credits
Plan 2.2		**72**	**credits**
Seminar		3	credits*
Required courses		12	credits
Elective courses	not less than	12	credits
Thesis	(equivalent to)	48	credits

***As non-credit subjects.**

Note: All students enrolled in both plans are required to pass the comprehensive examination.

3.1.3 Courses

3.1.3.1 Courses Code

The reference code for each subject is determined by 6 digits which are divided into two groups:

The first three digits designating the faculty/program:

715 Indicate Bioscience for Sustainable Agriculture Program of Faculty of Animal Sciences and Agricultural Technology

The last three digits designating the course code:

First digit refers to the hierarchy of the courses.

5-6 Indicates graduate courses

Second digit refers to the course type as below:

0-1 Indicates required courses

2-8 Indicates elective courses

9 Indicates thesis

Third digit indicates the numerical order of the courses.

3.1.3.2 Calculation of Credit Point

Lecture or discussion: 1 credit is equivalent to 1 hour per week

Laboratory or practice: 1 credit is equivalent to 3 hours per week

Thesis: 1 credit is equivalent to 3 hours per week

The number of credits for a course is calculated from the summary of the lecture hours per week (L),the practical hours per week (P) and the self-study hours per week (S) divided by 3 as shown the following formula:

$$\text{Number of credits} = \frac{L + P + S}{3}$$

Credit representation for a course including 4 digits:

The first digit, outside the parentheses, represents the number of credit of that course

The second, third and fourth digits, inside the parentheses, represent the following:

The second digit indicates the number of lecture hours per week(L)

The third digit indicates the practical hours per week (P)

The fourth digit indicates the self-study hours per week(S)

3.1.3.3 Curriculum Courses

Plan 1.1

Seminar 3 credits

(Course in which no credit will be given as part of the curriculum and its assessment will be given as S or U)

715 604	Seminar in Bioscience for Sustainable Agriculture I	1*(1-0-2)
715 605	Seminar in Bioscience for Sustainable Agriculture II	1*(1-0-2)
715 606	Seminar in Bioscience for Sustainable Agriculture III	1*(1-0-2)

Thesis

715 691	Thesis (equivalent to)	48 credits

***As non-credit subjects.**

Plan1.2

Seminar 6 credits

(Course in which no credit will be given as part of the curriculum and its assessment will be given as S or U)

715 601	Seminar I	1*(1-0-2)
715 602	Seminar II	1*(1-0-2)
715 603	Seminar III	1*(1-0-2)
715 604	Seminar in Bioscience for Sustainable Agriculture I	1*(1-0-2)
715 605	Seminar in Bioscience for Sustainable Agriculture II	1*(1-0-2)
715 606	Seminar in Bioscience for Sustainable Agriculture III	1*(1-0-2)

Thesis

715 692	Thesis (equivalent to)	72 credits

***As non-credit subjects.**

Plan 2.1

Required Courses 6 Credits

715 607	Seminar in Bioscience for Sustainable Agriculture I	1(1-0-2)
715 608	Seminar in Bioscience for Sustainable Agriculture II	1(1-0-2)
715 609	Seminar in Bioscience for Sustainable Agriculture III	1(1-0-2)
715 610	Advanced Cell and Molecular Bioscience	3(3-0-6)

Elective coursesnot less than6 credits

The elective courses can be chosen from the following list or can be chosen from the post-graduate courses provided by the Faculty of Animal Sciences and Agriculture Technology with the decision and content of the curricular academic committee.

715 621	Molecular Biology Techniques for Bioscience	3(2-3-4)
715 622	Bioinformatics for Research	3(3-0-6)
715 623	Enzyme Technology	3(2-3-4)
715 624	Population Genetics for Agricultural Research	3(3-0-6)
715 625	Application of Pharmacology in Veterinary Herbal Medicine Research	3(2-3-4)
715 626	Pathobiology for Research in Animal Science	3(2-3-4)
715 627	Advanced Aquaculture	3(3-0-6)
715628	Genetic and Molecular Biotechnology in Aquaculture	3(3-0-6)
715 629	Applications of Geographical Information Systems for Sustainable Agriculture	3(3-0-6)
715 630	Selected Topics in Bioscience for Sustainable agriculture3	3(3-0-6)

Thesis 36credits

715 693	Thesis (equivalent to)	36 credits

Plan2.2

Seminar 3 credits

(Course in which no credit will be given as part of the curriculum and its assessment will be given as S or U)

715 601	Seminar I	1*(1-0-2)
715 602	Seminar II	1*(1-0-2)
715 603	Seminar III	1*(1-0-2)

Required Courses 12 credits

715 502	Bioscience for Agricultural Sustainability	3 (2-3-4)
715 503	Research Methodology and Applied Bioscience for Agricultural Sustainability	3 (3-0-6)
715 607	Seminar in Bioscience for Sustainable Agriculture I	1 (1-0-2)
715 608	Seminar in Bioscience for Sustainable Agriculture II	1 (1-0-2)
715 609	Seminar in Bioscience for Sustainable Agriculture III	1 (1-0-2)
715 610	Advanced Cell and Molecular Bioscience	3 (3-0-6)

Elective courses not less than12 credits

The elective courses can be chosen from the following list or can be chosen from the post-graduate courses provided by the Faculty of Animal Sciences and Agriculture Technology with the decision and content of the curricular academic committee.

715 621	Molecular Biology Techniques in Bioscience	3(2-3-4)
715 622	Bioinformatics for Research	3(3-0-6)

715 623	Enzyme Technology	3(2-3-4)
715 624	Population Genetics for Agricultural Research	3(3-0-6)
715 625	Application of Pharmacology in Veterinary Herbal Medicine Research	3(2-3-4)
715 626	Pathobiology for Research in Animal Science	3(2-3-4)
715 627	Advanced Aquaculture	3(3-0-6)
715628	Genetic and Molecular Biotechnology in Aquaculture	3(3-0-6)
715 629	Applications of Geographical Information Systems for Sustainable Agriculture	3(3-0-6)
715 630	Selected Topics in Bioscience for Sustainable agriculture3	3(3-0-6)

Thesis 48 credits

715 694	Thesis (equivalent to)	48 credits

3.1.4 Study Plan

Plan 1.1

Year	Semester1			Semester2		
1	715 604	Seminar in Bioscience for Sustainable Agriculture I	1*(1-0-2)	715605	Seminar in Bioscience for Sustainable Agriculture II	1*(1-0-2)
				715691	Thesis (equivalent to)	12 credits
		Total	**0 credit**		**Total**	**12 credits**
2	715606	Seminar in Bioscience for Sustainable Agriculture III	1*(1-0-2)	715691	Thesis (equivalent to)	12 credits
	715691	Thesis (equivalent to)	12 credits			
		Total	**12 Credits**		**Total**	**12 credits**
3	715691	Thesis	6 credits	715691	Thesis	6 credits
		Total	**6 credits**		**Total**	**6 credits**
	Participate in a national or an international conference Present an oral thesis presentation to the advisory committee					

Plan 1.2

Year	Semester1			Semester2		
1	715 601	Seminar I	1*(1-0-2)	715 602	Seminar II	1*(1-0-2)
				715 692	Thesis (equivalent to)	6 credits
		Total	**0 credit**		**Total**	**6 credits**
2	715 603	Seminar III	1*(1-0-2)	715 604	Seminar in Bioscience for Sustainable Agriculture I	1*(1-0-2)
	715 692	Thesis (equivalent to)	6 credits	715 692	Thesis(equivalent to)	6 credits
		Total	**6 credits**		**Total**	**12 credits**
3	715 605	Seminar in Bioscience for Sustainable Agriculture II	1*(1-0-2)	715 606	Seminar in Bioscience for Sustainable Agriculture III	1*(1-0-2)
	715 692	Thesis (equivalent to)	9 credits	715 692	Thesis (equivalent to)	9 credits
		Total	**9 credits**		**Total**	**9 credits**
4	715 692	Thesis (equivalent to)	9 credits	715 692	Thesis (equivalent to)	9 credits
		Total	**9 credits**		**Total**	**9 credits**
5	715 692	Thesis (equivalent to)	9 credits	715 692	Thesis (equivalent to)	9 credits
		Total	**9 credits**		**Total**	**9 credits**
	Participate in a national or an international conference Present an oral thesis presentation to the advisory committee					

Plan 2.1

Year	Semester1			Semester2		
1	715 607	Seminar in Bioscience for Sustainable Agriculture I	1(1-0-2)	715 608	Seminar in Bioscience for Sustainable Agriculture II	1(1-0-2)
	715 610	Advance Cell and Molecular Bioscience	3(3-0-6)	715 xxx	Elective courses	6 credits
		Total	**4 credits**		**Total**	**7 credits**
2	715 609	Seminar in Bioscience for Sustainable Agriculture III	1(1-0-2)	715 693	Thesis (equivalent to)	9 Credits
	715 693	Thesis (equivalent to)	9 credits			
		Total	**10 credits**		**Total**	**9 credits**
3	715 693	Thesis (equivalent to)	9 credits	715 693	Thesis (equivalent to)	9 credits
		Total	**9 credits**		**Total**	**9 credits**
	Participate in a national or an international conference Present an oral thesis presentation to the advisory committee					

Plan 2.2

Year	Semester1			Semester2		
1	715 610	Advance Cell and Molecular Bioscience	3(3-0-6)	715 602	Seminar II	1*(1-0-2)
	715 502	Sustainable Agriculture and Marketing	3(3-0-6)	715 xxx	Elective courses	6 credits
	715 503	Research Methodology and Statistical Analysis Techniques	3(3-0-6)			
	715 601	Seminar I	1*(1-0-2)			
		Total	**9credits**		**Total**	**6credits**
2	715 603	Seminar III	1*(1-0-2)	715 607	Seminar in Bioscience for Sustainable Agriculture I	1(1-0-2)
	715 xxx	Elective courses	3 credits	715 xxx	Elective courses	3 credits
		Total	**3credits**		**Total**	**4credits**
3	715 608	Seminar in Bioscience for Sustainable Agriculture II	1(1-0-2)	715 609	Seminar in Bioscience for Sustainable Agriculture III	1(1-0-2)
	715 694	Thesis (equivalent to)	8 credits	715 694	Thesis (equivalent to)	8 credits
		Total	**9credits**		**Total**	**9credits**
4	715 694	Thesis (equivalent to)	8 credits	715 694	Thesis (equivalent to)	8 credits
		Total	**8 credits**		**Total**	**8 credits**
5	715 694	Thesis (equivalent to)	8 credits	715 694	Thesis (equivalent to)	8 credits
		Total	**8 credits**		**Total**	**8 credits**
	Participate in a national or an international conference Present an oral thesis presentation to the advisory committee					

3.1.5 Course Description

Credits

715 502 Bioscience for Agricultural Sustainability **3(3-0-6)**

Integration of bioscience with local wisdom, relationship between natural resources and farming, models of sustainable farming, impact of

farming to the environment, bioscience in agricultural product development and processing, and marketing of agricultural products.
Field trip required.

715 503 Research Methodology and Applied Bioscience for Agricultural Sustainability **3(3-0-6)**

Research and research questions, error in research, research design, research method, research tool, population and sampling, statistical analysis techniques and research presentation.

715 601 Seminar I **1(1-0-2)**

Practice of reading skill on recent agricultural bioscience research documents, improving ability on critical thinking process, discussion and presentation of research work under advisory of seminar instructors.

715 602 Seminar II **1(1-0-2)**

Pre-requisite: 715 601 Seminar I

Searching, compiling the information, discussion and presentation of research in bioscience for sustainable agriculture.

715 603 Seminar III **1(1-0-2)**

Pre-requisite: 715 601 Seminar II

Seminar in the topics of interest in bioscience for sustainable agriculture or topics related to student's thesis, competency of scientific analytical thinking and research planning related to the student's thesis.

715 604 Seminar in Bioscience for Sustainable Agriculture I **1(1-0-2)**

Criteria: Assessment will be given as S or U

Pre-requisite:715 603 Seminar 3 (For student enrolled in plan 1.2)

Study, searching and compiling the research information in bioscience for sustainable agriculture related to student's thesis, practice in scientific research writing, research planning and presentation to audience under supervision of seminar instructors.

715 605 Seminar in Bioscience for Sustainable Agriculture II 1(1-0-2)

Criteria: Assessment will be given as S or U

Pre-requisite: 715 604 Seminar in Bioscience for Sustainable Agriculture I

Seminar on current topics in bioscience for sustainable agriculture and exchange of ideas with experts and local philosophers

715 606 Seminar in Bioscience for Sustainable Agriculture III 1(1-0-2)

Criteria: Assessment will be given as S or U

Pre-requisite: 715 605 Seminar in Bioscience for Sustainable Agriculture II

Seminar in current topics in bioscience for sustainable agriculture by integration of bioscience knowledge to wisdom of local philosophers, and discussion for application of local wisdom to research work.

715 607 Seminar in Bioscience for Sustainable Agriculture I 1(1-0-2)

Pre-requisite:715 603 Seminar 3 (For student enrolled in plan 2.2)

Study, searching and compiling the research information in bioscience for sustainable agriculture related to student's thesis, practice in scientific research writing, research planning and presentation to audience under supervision of instructors.

715 608 Seminar in Bioscience for Sustainable Agriculture II 1(1-0-2)

Pre-requisite: 715 607 Seminar in Bioscience for Sustainable Agriculture I

Seminar on current topics in bioscience for sustainable agricultureand exchange of ideas with experts and local philosophers.

715 609 Seminar in Bioscience for Sustainable Agriculture III 1(1-0-2)

Pre-requisite: 715 608 Seminar in Bioscience for Sustainable Agriculture II

Seminar in current topics in bioscience for sustainable agriculture by integration of bioscience knowledge to wisdom of local philosophers, and discussion for application of local wisdom to research work.

715 610 Advanced Cell and Molecular Bioscience 3(3-0-6)

Structure and function of biological molecule, cell structure and function, genetic material and replication, cell division and cell cycle, gene expression, gene regulation, cell differentiation, mutation, cell signaling, cell response, energy and metabolites manipulation in the cells, andcurrent topic in molecular bioscience.

715 621 Molecular Biology Techniques in Bioscience 3(2-3-4)

DNA and RNA extraction, polymerase chain reaction, electrophoresis, cloning, sequencing, molecular hybridization, DNA microarray, immunefluorescence staining technique, and bioinformatics for bioscience study.

715 622 Bioinformatics for Research 3(3-0-6)

Biological database utilization, nucleic acid analysis and sequence alignment, bioinformatics for gene cloning and expression, protein bioinformatics database, analysis of protein structure and function, prediction of posttranslational modification of proteins, protein modeling and drug design.

715 623 Enzyme Technology 3(2-3-4)

Introduction to enzymes, mechanism of enzyme catalysis, enzyme structure specificity and stability, natural and recombinant enzyme production and purification, industrial enzymes, methods in improvement of enzyme activity using genetic engineering approach.

715 624 Population Genetics for Agricultural Research 3(3-0-6)

Mendel’s concept, Hardy-Weinberg principle, allele frequency, evolutionary processes, adaptation and speciation, statistical analysis for population genetics study, application of Mendel’s theory for studying population genetic (in both animal and plant) under Hardy-Weinberg equilibrium.

715 625 Application of Pharmacology in Veterinary Herbal MedicineResearch 3(2-3-4)

The feasibility of application of pharmacological techniques in medicinal plants and natural products research, the steps of extraction and fractionation of active compounds from medicinal plants for pharmacological and toxicological test.

715 626 Pathobiology for Research in Animal Science 3(2-3-4)

Principles of pathology and pathogenesis, inflammation and wound healing, cellular adaptation after injury, genetic abnormalities and hemodynamic disorders, metabolic disorders of carbohydrate, protein, lipid, minerals and colorants, abnormal cell growth and cancer.

715 627 Advanced Aquaculture 3(3-0-6)

Principles and practices in aquaculture, including aspects in culture systems, nutrition and feeding, water quality management, disease prevention and control, and evaluation of growth and production.

Field trip required.

715 628 Genetic and Molecular Biotechnology in Aquaculture 3(3-0-6)

Genetic variation at the molecular level in aquatic animals, genomic tools and genome mapping, gene expression and functional analysis, cloning and DNA sequencing techniques, gene transfer and transgenic aquatic organisms, commercial application of genetic biotechnology in aquaculture.

715 629 Applications of Geographical Information Systems for Sustainable Agriculture 3(3-0-6)

Knowledge in geographical information systems (GIS), digital image processing, and application of GIS and meteorology in weather forecast for sustainable agriculture farming system.

715 630 Selected Topics in Bioscience for Sustainable agriculture 3(3-0-6)

Topics of current interest in Bioscience for Sustainable agriculture

715 691 Thesis Equivalent to 48 credits

Implementation of research project under the supervision of advisory committee. Thesis defense and publishing the manuscript in peered review journal.

715 692 Thesis Equivalent to 72 credits

Implementation of research project under the supervision of advisory committee. Thesis defense and publishing the manuscript in peered review journal.

715 693 Thesis Equivalent to 36 credits

Implementation of research project under the supervision of advisory committee. Thesis defense and publishing the manuscript in peered review journal.

715 694 Thesis Equivalent to 48 credits

Implementation of research project under the supervision of advisory committee. Thesis defense and publishing the manuscript in peered review journal.

3.2 Name, I.D. number, title and degree of the lecturers

3.2.1 Full time lecturers of the curriculum

No.	Name (Academic position and ID number)	Education and institutions	Teaching hours/week	
			Current program	Revised Program
1.	Dr. Narin Preyavichyapugdee	Ph.D. (Pathobiology) Mahidol University (2007) D.V.M., Kasetsart University (1995)	12	9
2.	Dr. Chanjira Sitthiya	Ph.D (Animal Science) Ehime University, Japan (2015) M.Sc. (Animal Science) Kagawa University, Japan (2012) B.Sc. MaeJo University (2005)	9	6
3.	Dr. Atthapol Thiantong	Ph.D. (Animal Science) National Chung Hsing University, Taiwan (2015) B.Sc. (Animal Breeding) Maejo University (2009)	12	9
4.	Dr. Panida Duangkaew	Ph.D. (Biochemistry) Mahidol University (2012) B.Sc. (Biology) Mahidol University (2005)	15	9
5.	Dr. Chaowanee Laosutthipong	Ph.D. (Biotechnology) Mahidol University (2012) M.Sc. (Immunology) Mahidol University (2005) B.Sc. (Biology) Silpakorn University (2002)	12	9

3.2.2 Full time instructors

No.	Name (Academic position and ID number)	Education and institutions	Teaching hours/week	
			Current program	Revised Program
1.	Dr. Narin Preyavichyapugdee	Ph.D. (Pathobiology) Mahidol University (2007) D.V.M., Kasetsart University (1995)	12	9
2.	Dr. Chanjira Sitthiya	Ph.D. (Animal Science) Ehime University, Japan (2015) M.Sc. (Animal Science) Kagawa University, Japan (2012) B.Sc. MaeJo University (2005)	9	6
3.	Dr. Atthapol Thiantong	Ph.D. (Animal Science) National Chung Hsing University, Taiwan (2015) B.Sc. (Animal Breeding) Maejo University (2009)	12	9
4.	Dr. Panida Duangkaew	Ph.D. (Biochemistry) Mahidol University (2012) B.Sc. (Biology) Mahidol University (2005)	15	9
5.	Dr. Chaowanee Laosutthipong	Ph.D. (Biotechnology) Mahidol University (2012) M.Sc. (Immunology) Mahidol University (2005) B.Sc. (Biology) Silpakorn University (2002)	12	9
6.	Assoc. Prof. Dr. Pantipa Na Chiangmai	Ph.D. (Crop Production Technology) Suranaree University of Technology (2004) M. Sc. (Agriculture) Chiang Mai University (1999) B.Sc. (Agriculture) Chiang Mai University (1997)	15	6

No.	Name (Academic position and ID number)	Education and institutions	Teaching hours/week	
			Current program	Revised Program
7.	Assist. Prof. Dr.Pattaraporn Poommarin	Ph.D. (Animal Science) University of the Philippines at Los Baños (2014) M.Sc. (Animal Science) KhonKaen University (2002) B.Sc. (Agriculture) KhonKaen University (2002)	12	6
8.	Assist. Prof. Dr. Surawat Chalorsuntisakul	Ph.D. (Pharmacy) Chiang Mai University (2010) M.Ag. Sukhothai Thammathirat Open University (2006) D.V.M., Chulalongkorn University (2001)	15	9
9.	Dr. Wilaiwan Sirirotjanaput	M.S. (Agricultural Economics) Kasetsart University (1999) B.S. (Agricultural Economics) Kasetsart University (1995)	12	15
10.	Dr. Pawapol Kongchum	Ph.D. (Fisheries and Wildlife Sciences) Virginia Polytechnic Institute and State University, USA (2010) M.S. (Aquaculture) Central Luzon State University, Philippines (1999) B.Sc. (Fisheries) Rajamangala Institute of Technology (1992)	10	15
11.	Dr. Kaewta Limhang	Ph.D. (Fisheries Science) Kasetsart University (2010) M.Sc.(Fisheries Science), Kasetsart University (2005) B.Sc. (Fisheries), Kasetsart University (2003)	15	15

No.	Name (Academic position and ID number)	Education and institutions	Teaching hours/week	
			Current program	Revised Program
12.	Dr. Kritiya Lertchunhakite	Ph.D. (Animal Science) KhonKaen University (2012) M.Sc. (Zoology) Kasetsart University (2002) B.Sc. (Agriculture) King Mongkut's Institute of Technology Ladkrabang (1998)	12	6
13.	Dr. Anan Choukrou	Ph.D. (Animal Science) KonKaen University (2009) M.Sc. (Animal Science) KhonKaen University (2546) B.Sc. (Animal production technology) Suranaree University of Technology (1998)	12	9
14.	Dr.Supawadee Manatrinon	Ph.D. (Animal Breeding) University of Natural Resources and Applied Life Sciences, Vienna, Austria (2009) M.Sc. (Animal Production Technology) Suranaree University of Technology (2002) B.Sc. (Biotechnology) Silpakorn University (1999)	15	15
15.	Assist. Prof. Charunee Kasornpikul	Ph.D. (Pharmacy) Chiang Mai University (2009) M.P.H (Veterinary Medicine) Mahidol University (2003) D.V.M. Chulalongkorn University (2001)	15	9
16.	Dr. Pornpan Saenpoom	Ph.D.(Animal Nutrition) Universiti Putra Malaysia (2012) M.Sc. (Animal Science) KhonKaen University (2003) B.Sc. (Agriculture) KhonKaen University (2000)	12	6

No.	Name (Academic position and ID number)	Education and institutions	Teaching hours/week	
			Current program	Revised Program
17.	Dr. Warangkana Kitpipit	Ph.D (Animal Science) Kasetsart University (2012) M.Sc. (Animal Breeding) Chulalongkorn University (2002) B.Sc. (Agriculture) Prince of Songkla University (1998)	12	6
18.	Dr.Thanawadee Promchan	Ph.D. (Plant Science) Prince of Songkla University (2005) M.Sc. (Plant Science) Prince of Songkla University (2005) B.Sc. (Bioproduction) Prince of Songkla University (2005)	15	6
19.	Dr.Sararat Monkhung	Ph.D. (Plant Pathology) Chiang Mai University (2013) B.Sc. (Plant Pathology) Chiang Mai University (2008)	15	6
20.	Dr. Saowapar Khianngam	Ph.D. (Pharmaceutical Chemistry and Natural Products) Chulalongkorn University (2011) M.Sc. (Industrial Microbiology) Chulalongkorn University (2006) B.Sc. (Microbiology) Prince of Songkla University (2004)	12	9
21.	Assoc. Prof. Mana Kanjanamaneesathian	Certificate of Proficiency In EnglishVictoria University of Wellington, New Zealand (1991) M.Appl.Sc.(Microbiology) Lincoln University, New Zealand (1994) M.Sc. (Agriculture) Kasetsart University (1988) B.Sc. (Agriculture) Kasetsart University (1985)	15	6

3.2.3 Special Instructors

Order	Position, First name-Last Name	Qualification, Major, Institute, Year of graduation
1.	Prof. Dr. Charan Chantharakhana	Ph.D. (Animal Breeding) Iowa State University, USA (1968) M.S. (Animal Science) Iowa State University, USA (1962) B.S. (Animal Science) Iowa State University, USA (1959)
2.	Prof. Dr. Metha Wanapat	Post Doc. (Straw treatment) Agricultural University of Norway, Norway (1983) Ph.D. (Ruminant Nutrition) North Dakota State University, USA (1980) M.S. (Ruminant Nutrition) North Dakota State University, USA (1978) B.Sc. (Animal Science) KhonKaen University (2519)
3.	Prof. Dr. Sanit Aksornkoae	Ph.D. (Plant Ecology) 1975 Michigan State University, USA (1975) M.Sc. (Forestry) Kasetsart University (2513) B.Sc. Kasetsart University (2508)
4.	Prof. Uthairat Na-Nakorn	Ph.D. (Genetics and Breeding in Aquatic Animals) Ehime University, JAPAN (1998) M.Sc. (Genetics) Kasetsart University (2521) B.Sc. (Fisheries) Kasetsart University (2517)

4. Details of practicum (if any)

None

5. Thesis requirement (if any)

5.1 Short description

This curriculum requires the students to use the holistic approach to identify research question and to work on thesis topic based upon the problems of the community development.

5.2Standard learning outcomes

The students possess the understanding of systematic research planning with the capability to integrate basic and applied knowledge and write the research report which can be disseminated at the international conferences.

5.3Instruction period

Plan 1.1 Semesters 2: Year 1 - Semester 2: Year 3

Plan 1.2 Semesters 2: Year 1 - Semester 2: Year 5

Plan 2.1 Semesters 1: Year 2 - Semester 2: Year 3

Plan 2.2 Semesters 1: Year 3 - Semester 2: Year 5

5.4Number of credits

Plan 1.1 Thesis (equivalent to) 48 credits

Plan 1.2 Thesis (equivalent to) 72 credits

Plan 2.1 Thesis (equivalent to) 36 credits

Plan 2.2 Thesis (equivalent to) 48 credits

5.5Preparation

(1) Students (in all study plans) must be individually tasked with a research project. This will start with the seminar courses in which the students are required to undertake independent study and present the seminar in the class. During the course of engaging in seminar, the students will be in a position to identify their interest in any particular research area and this will be subsequently developed into a thesis proposal.

(2) Approval of thesis proposal by Thesis Examination Committee for graduate study.

(3) Assignment of the primary thesis advisor of individual student.

This proposal must later be approved in accordance with the standard criteria for graduate study B.E. 2550 (2007)

5.6 Assessment

The program's evaluation must be in accordance with Silpakorn University's Regulations on Graduate Study B.E. 2550 (2007) as in 26.4 and section 6 in the following topics:

1) Approval of thesis proposal and project, Thesis registration, Conduct of research under the guidance of a primary thesis advisor and a co-advisor (if any)
2) Student submission of progress report to the primary thesis advisor and a co-advisor (if any) every semester, Evaluation report on student's thesis progress at the end of every semester, and Submission to and request for evaluation from the Thesis Examination Committee. Evaluation result will be reported as IP (in progress) or NP (no progress).
3) There must be at least 3 but not more than 5 members of Thesis Examination Committee, which shall consist of the head of the department or a person authorized by the head of the department (which shall not be the primary advisor of the thesis being examined), the primary advisor and not more than 3 qualified persons (at least one of which must be an external examiner). The Thesis evaluation results will be reported as 4 levels including "Excellent", "Good", "Passed", and "Failed".

Section 4 Learning outcome, Teaching strategy and Evaluation

1. Developing a Special Student Characters

The doctor of philosophy program in bioscience for sustainable agriculture of the Faculty of Animal Sciences and Agricultural Technology anticipates that the students shall possess the following:

Special character	Strategy or Student Activities
Academic aspect	Lecture with student participation in the classroom, after which written and oral examinations will be conducted to assess student's understanding.
Continuing study	Provide the platform for the students to conduct independent study in the current topics and assess the performance of the students in executing such activities.
Analytical	Provide the platform for the students to perform writing skills for academic purpose and evaluate their performance based upon their capability in established sound research questions in sustainable agriculture.
Morality and ethic	The lecturers point out ethical and moral issues in proper professionalism and assess their attitude.

2. Developing Learning Outcomes in Each Area

2.1 Morals and Ethics

2.1.1 Target Outcome

Students are to possess moral and professional ethics in order to live and work with others harmoniously and benefit the society. In addition, since the research in agriculture is related to the safety and life of consumers, thus the researcher in agricultural field must have responsibility to any consequence occurs due to their work similar to other discipline of career. Instructors teaching in the curriculum must teach the student to develop moral and professional ethics together with all the knowledge as a whole according to these 7 following attributes:

(1) Moral, ethical, sacrificing and honest

(2) Possess discipline, punctuality and responsibility to themselves and society

(3) Possess both leadership and teamwork skills with the capacity to solve conflict and prioritize tasks

(4) Respect and behave according to social norms under the concept and principles of good governance

(5) Respect rules and regulations of the organization and society

(6) Possess professionalism and observe professional ethic

(7) Being a role model as an individual and as in the duty

2.1.2 Teaching Strategies

Instill the concept of morals and ethics in carrying out studies as well as learning to live and work together both in class and during fieldwork so as to develop maturity in every aspect through respecting themselves and others and respect to their career.

2.1.3 Evaluation Strategies

(1) Cases of misconduct in thesis plagiarism and misconduct in examination

(2) Evaluate from tasks which have been assigned to accomplish

2.2 Knowledge

2.2.1 Target Outcome

Students must have good knowledge in animal husbandry, aquatic animals, and sustainable agriculture for securing job and developing the society. For this the students must possess the following:

(1) Possess knowledge and comprehension of theories and principles in the field of study

(2) Possess analytical capability and able to use them in solving problems

(3) Able to follow the current knowledge and develop the way how to acquire knowledge continuously

(4) Have overall understanding on the subjects and identify changes and effect of new technology to changes

(5) Able to integrate the content of the subjects to other disciplines

(6) Able to develop the innovation and synthesize new knowledge to solve the problem creatively

2.2.2 Teaching Strategies

Use multiple methodology in the learning-teaching process based upon the real situation and the technological changes. The learning-teaching process must be conducted in the field by way of excursion and internship in the participating organizations. Special lecturers should also be invited to provide specific knowledge on the case by case basis.

2.2.3 Evaluation Strategies

Evaluate from students' achievements in terms of knowledge and performance in different aspects according to the following:

(1) Quiz.

(2) Midterm and Final examinations.

(3) Assessment of the writing report.

(4) Assessment of the research plan.

(5) Assessment of the presentation.

2.3 Intellectual Skill

2.3.1 Target Outcome

Students are to have ability in their studies and research; able to make analyses and conduct interdisciplinary research by integrating knowledge of various fields that they have learnt from the program in striving for research excellence so as to possess the following skills:

(1) Able to think systematically and rationally

(2) Able to think and solve problems creatively and appropriately based on the knowledge that they have gained

(3) Able to search, interpret, and evaluate information technology and use it creatively

(4) Able to collect, analyze and summarize the issues which are needed

(5) Able to apply and integrate knowledge and intellectual skill in solving the complex problems issues and develop new knowledge

2.3.2 Teaching Strategies

(1) Use special case in research for application in animal science to solve the problem of the farmers.

(2) Organize group discussions

2.3.3 Evaluation Strategies

Evaluate the outcome with the examination paper to gauge the student's ability in solving problems and in applying knowledge, excluding the examination based upon multiple choices and questions regarding definitions.

2.4 Interpersonal Skill and Responsibility

2.4.1 Target Outcome

Students must work in the new environment where there is a need to adapt and adjust to the new people. There are various interactions, such as among colleagues, between senior staffs and junior staffs, and in hierarchical term (between boss and normal staffs), in which the students must learn so as to integrate comfortably in the organization. The following is the content in which the students should possess:

(1) Possess the responsibility as an individual and as a member of the group.

(2) Adapt and work with other colleagues both as a leader and as a member of the group.

(3) Behave and express one opinion adequately according to role and responsibility.

(4) Plan and take proper responsibility for continuing self-development.

2.4.2 Teaching Strategies

In assigning the group work, working with the other students across curriculum, or acquiring the knowledge from the experts through interview, the following interpersonal characteristics are needed:

(1) Able to work with other effectively

(2) Responsible to the task assigned

(3) Adapt to the situation and organizational culture effectively

(4) Possess good interpersonal with colleagues and other people

(5) Have leadership skill

2.4.3 Evaluation Strategies

Evaluate from the behavior and attitude of the students from the accurate content and data quality of the presentation and activities in the classroom.

2.5 Skills in Statistical Analysis, Communication and Use of Information Technology

2.5.1 Target Outcome

Students are to possess the following skills:

(1) Able to identify and use mathematics and statistics in analyzing data and use the analysis to solve the problems effectively

(2) Able to summarize and communicate in oral and writing and choose the appropriate presentation creatively to various audiences

(3) Able to identify, access, and screen information related to science and technology from database in the national and international sources

(4) Possess proper skill to use appropriate information technology and apply it for proper collection, translation and communicate

(5) Able to keep up with the latest development in the information technology

(6) Have a capacity to communicate in both Thai and English (both in oral and in written forms) in the academic setting and non-academic setting. The students should also have a capability to present in the academic format (publication in the scientific journal)

and popular format (newspaper and magazine). The students must be able to write a whole thesis after experiment has been executed.

2.5.2 Teaching Strategies

Arrange the activities in the subjects so that the students will be able to analyze effectively in both the real setting and virtual setting and apply the techniques to various situations.

2.5.3 Evaluation Strategies

The evaluation can be conducted during learning-teaching process, in which the students must learn how to solve problems, analyze how effective the techniques used to solve the problems are, and present this acquired learning in the classroom. Discussion among the lecturers and the students are encouraged.

3. Curriculum Mapping

Keys to Learning Outcome Table are as follows:

1. Morals and Ethics

(1) Moral, ethical, sacrificing and honest

(2) Possess discipline, punctuality and responsibility to themselves and society

(3) Possess both leadership and teamwork skills with the capacity to solve conflict and prioritize tasks

(4) Respect and behave according to social norms under the concept and principles of good governance

(5) Respect rules and regulations of the organization and society

(6) Possess professionalism and observe professional ethic

(7) Being a role model as an individual and as in the duty

2. Knowledge

(1) Possess knowledge and comprehension of theories and principles in the field of study

(2) Possess analytical capability and able to use them in solving problems

(3) Able to follow the current knowledge and develop the way how to acquire knowledge continuously

(4) Have overall understanding on the subjects and identify changes and effect of new technology to changes

(5) Able to integrate the content of the subjects to other disciplines

(6) Able to develop the innovation and synthesize new knowledge to solve the problem creatively

3. Intellectual Skill

(1) Able to think systematically and rationally

(2) Able to think and solve problems creatively and appropriately based on the knowledge that they have gained

(3) Able to search, interpret, and evaluate information technology and use it creatively

(4) Able to collect, analyze and summarize the issues which are needed

(5) Able to apply and integrate knowledge and intellectual skill in solving the complex problems issues and develop new knowledge

4. Interpersonal Skill and Responsibility

(1) Possess the responsibility as an individual and as a member of the group.

(2) Adapt and work with other colleagues both as a leader and as a member of the group.

(3) Behave and express one opinion adequately according to role and responsibility.

(4) Plan and take proper responsibility for continuing self-development

5. Skills in Statistical Analysis, Communication and Use of Information Technology

(1) Able to identify and use mathematics and statistics in analyzing data and use the analysis to solve the problems effectively

(2) Able to summarize and communicate in oral and writing and choose the appropriate presentation creatively to various audiences

(3) Able to identify, access, and screen information related to science and technology from database in the national and international sources

(4) Possess proper skill to use appropriate information technology and apply it for proper collection, translation and communicate

(5) Able to keep up with the latest development in the information technology

(6) Have a capacity to communicate in English both in oral and in written forms in the academic setting and non-academic setting. The students should also have a capability to present in the academic format (publication in the scientific journal) and popular format (newspaper and magazine). The students must be able to write a whole thesis after experiment has been executed.

Curriculum Mapping of Responsibilities in Producing Standard Learning Outcomes for Each Course in the Curriculum

● Primary responsibility ○ Secondary responsibility

Courses	1. Morality, Ethics							2. Knowledge						3. Education skills					4. Interpersonal skills and responsibilities				5. Mathematical analysis, communication, and IT skills					
	1	2	3	4	5	6	7	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	1	2	3	4	5	6
715 502 Bioscience for Sustainable Agriculture	●	●	o	o	o	o	o	●	●	o	o	o	o	●	o	●	o	o	●	●	o	o	●	o	●	o	o	o
715 503 Research Methodology and Applied Bioscience for Agricultural Sustainability	o	●	o	o	o	o	o	●	●	o	o	o	o	●	●	o	o	o	●	o	o	o	●	o	o	o	o	o
715 601 Seminar I	o	●	●	●	●	o	o	o	●	●	o	o	o	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 602 Seminar II	o	●	●	●	●	o	o	o	●	●	●	o	o	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 603 Seminar III	o	●	●	●	●	o	o	o	●	●	●	●	o	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 604 Seminar in Bioscience for Sustainable Agriculture I	o	●	●	●	●	o	o	o	●	●	●	●	●	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 605 Seminar in Bioscience for Sustainable Agriculture II	o	●	●	●	●	o	o	o	●	●	●	●	●	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 606 Seminar in Bioscience for Sustainable Agriculture III	o	●	●	●	●	o	o	o	●	●	●	●	●	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 607 Seminar in Bioscience for Sustainable Agriculture I	o	●	●	●	●	o	o	o	●	●	●	●	●	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 608 Seminar in Bioscience for Sustainable Agriculture II	o	●	●	●	●	o	o	o	●	●	●	●	●	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 609 Seminar in Bioscience for Sustainable Agriculture III	o	●	●	●	●	o	o	o	●	●	●	●	●	●	●	●	●	o	●	o	●	o	●	●	●	●	●	●
715 610 Advanced Cell and Molecular Bioscience	o	●	o	o	o	o	o	●	o	o	o	o	o	●	o	o	o	o	●	o	o	o	o	o	●	o	o	o
715 621 Molecular Biology Techniques in Bioscience	o	●	o	o	o	o	o	●	●	o	o	o	o	●	o	o	●	o	●	●	o	o	o	o	●	o	o	o

Courses	1. Morality, Ethics							2. Knowledge						3. Education skills					4. Interpersonal skills and responsibilities				5. Mathematical analysis, communication, and IT skills					
	1	2	3	4	5	6	7	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	1	2	3	4	5	6
715 622 Bioinformatics for Research	o	●	o	o	o	●	o	●	o	o	o	o	o	●	o	o	●	o	●	●	o	o	●	o	●	o	o	o
715 623 Enzyme Technology	o	●	o	o	o	o	o	●	o	o	o	o	o	●	o	o	o	o	●	●	o	o	o	o	●	o	o	o
715 624 Population Genetics for Agricultural Research	o	●	o	o	o	o	o	●	o	o	o	o	o	●	o	o	●	o	●	o	o	o	●	o	●	o	o	o
715 625 Application of Pharmacology in Veterinary Herbal Medicine Research	o	●	o	o	o	●	o	●	o	•	o	o	o	●	o	o	o	o	●	o	o	o	o	o	●	o	●	o
715 626 Pathobiology for Research in Animal Science	o	●	o	o	o	o	o	●	o	o	o	o	o	●	o	o	●	o	●	o	o	o	●	o	●	o	o	o
715 627 Advanced Aquaculture	o	●	o	o	o	o	o	●	o	o	o	o	o	●	o	o	●	o	●	●	o	o	●	o	●	o	o	o
715 628 Genetic and Molecular Biotechnology in Aquaculture	o	●	o	o	●	o	o	●	o	o	o	o	o	●	o	o	●	o	●	●	o	o	●	o	●	o	o	o
715 629 Applications of Geographical Information Systems for Sustainable Agriculture	●	o	o	o	o	o	●	o	o	o	o	o	●	o	o	●	o	●	o	o	o	●	o	●	o	o	o	●
715 630 Selected Topics in Bioscience for Sustainable Agriculture	●	o	o	o	o	o	●	o	o	o	o	o	●	o	o	●	o	●	o	o	o	●	o	●	o	o	o	●
715 691 Thesis	o	●	o	o	●	●	o	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
715 692 Thesis	o	●	o	o	●	●	o	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
715 693 Thesis	o	●	o	o	●	●	o	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
715 694 Thesis	o	●	o	o	●	●	o	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Section 5 Evaluation criteria

1. Grading regulations or criteria

Assessment and Graduation are consistent with Silpakorn University's Regulations on Graduate Study B.E. 2550 (2007).

2. Student's achievement standard review process

The review processes of student's achievement standard in all courses are as follows:

2.1 Review of student's learning outcome before graduation

(1) Re-evaluate at the course level, in which the students should evaluate the teaching in the courses they have taken. The appointed committee will conduct review the suitability of the examination papers basing upon the teaching plan.

(2) Re-evaluate at the curricular level under the internal quality assurance of the university after which the result should have been reported.

2.2 Review of student's learning outcome after graduation

The emphasis is on continuous research of student career achievement and use research results to improve on instructional process and integrated curriculum as well as to evaluate curriculum quality. Components to be reviewed are:

(1) Evaluation of employment rate of each class of graduates in terms of graduate's job search period, knowledge, ability, and career confidence.

(2) Interview or questionnaire survey of graduate employer's opinions and satisfaction at different intervals, for example, after one or three years of employment.

(3) Evaluation by other educational institutes thought interview or questionnaire survey on the level of satisfaction on graduate's knowledge, readiness and other qualifications.

(4) Evaluation by graduates with employment in terms of the readiness and knowledge gained from Bioscience in Sustainable Agriculture and other course provided in the program, including the relevancy of these courses to graduate's employment. Opinions on how to improve the curriculum are invited.

(5) Concrete and measurable student's achievement such as number of patents granted, number of social and professional awards of recognition.

(6) Assess the view from the external experts or invited lecturers with respect to the student's learning capacity or other related traits.

(7) The number of research presented at the conferences or the number of the publication in the national and international journals.

3. Graduation criteria

3.1 In accordance with the Silpakorn University regulation regarding Postgraduate study 2007 section 7 and/or the revision of this regulation.

3.2 Comply with the conditions and rules of the curriculum as follows:

3.2.1 Passed (Obtain “S”) the comprehensive examination

3.2.2 Thesis or part of the thesis conducted has been accepted for publication in the national peer-reviewed journal/transaction at least 2 paper or

Thesis or part of the thesis conducted has been accepted for publication in the national peer-reviewed journal/transaction at least 1 paper and present thesis/part of the thesis in the international conferences with full-paper published in the conference proceeding at least 1 paper.

3.2.3 The students must attend the national or international conference in the field related to agriculture at least one time. The students need to interact with at least one speaker and the 2-3 conference participants to develop communication skill in English. The synopsis of this interaction must be included in the thesis as an appendix.

Section 6 Teaching staff development

1. New instructor's orientation

(1) Conduct orientation for the newly-recruited lecturers with respect to the role and duty of the lecturers in bringing about proper learning to the students.

(2) Conduct orientation for the newly-recruited lecturers with the emphasis on the details of the curriculum, such as Philosophy, Objectives of the curriculum, Rule and Regulation promulgated by the university.

(3) Conduct orientation for the newly-recruited lecturers with the emphasis on the details of the courses being offered at the faculty and the expectation in which the students should accomplish in each courses.

(4) Provide coaching to the newly-recruited lecturers and monitor their working in teaching for at least 1 academic semester.

2. Development the knowledge and theskills to the newly-recruited lecturers

Ensure that all newly-recruited lecturers have the opportunity to develop further in their career path. It is a requirement that they have attended to any program aiming to develop their ability at least once a year.

2.1 Development of knowledge and skills in teaching-learning, and evaluation

(1) Conduct hand-on training regarding teaching-learning activities (such as teaching techniques, evaluation ect.). This is implemented by the Registration Division of Silpakorn University annually and the activity aims for the newly-recruit lecturers at the first year of their work, followed by another similar activity every 2-3 years.

(2) Equip with teaching skills with the emphasis on the philosophy of placing the students as the focal points in teaching-learning activities.

(3) Encourage the lecturers to attend or to receive further training and transfer the knowledge to the staffs in the faculty

(4) Exchange the ideas and share the experience among the lecturers in the faculty

(5) Share documents among the stakeholders

(6) Invite other lecturers to participate in the class and give recommendation.

(7) Support classroom research for developing teaching-learning techniques and disseminate the finding to the network with work on the development of curriculum and education.

2.2 Academic and other professional skills development

(1) Encourage instructor to participate in academic knowledge service to local community in order to enhance their experience and merit.

(2) Encourage instructor to conduct researches to generate new body of knowledge and develop teaching skills to become experts in their field.

(3) Stimulate, promote and encourage instructor to produce academic works: book or textbooks and academic publications in order to achieve higher academic position
(4) Allocate research budget and arrange to have all instructors participated in various research groups in the faculty.
(5) Promote and endorse presentation of academic work in various formats of journal publication or academic publication.

Section 7 Curriculum quality assurance

1. Curriculum administration

The curriculum shall be managed by curricular academic committee which is composed of Deputy Dean in charge of Academic Affair, as the Head of the committee, and other lecturers who are appointed to manage this curriculum. The role of this committee is to provide recommendation and set the policy in which the lecturers should transform to activities.

The committee in conjunction with the faculty administration should lay out the plan for academic activities in each semester. This committee should also monitor activities and gather the data from the implementation of the activities. This data shall be used to continually improving the curriculum.

Goals	Operations	Evaluation
1. Develop curriculum continuously and being the leader in creating new knowledge in the area of animal sciences and agricultural technology	1. Provide new curriculum based on the accepted standard of animal sciences and agricultural technology 2. Revise the curriculum every 5 years	1. The curriculum is standardized and accepted by the professional organization on the regular basis
2. Students are encouraged to learn and possess learning techniques to acquire new knowledge	1.Provide learning-teaching platform where the students can conduct self-study 2.Provide teaching assistance to stimulate student learning	1. The laboratory and self-studied subjects are provided for new knowledge acquisition
3. Curriculum review and improvement to keep up with high quality and standard	1. Require that the lecturers must possess at least M.Sc. or possess enough experience as specified standard 2. Encourage the lecturers to play a leading academic role 3. Encourage the lecturers to visit the academic institutes both nationally and internationally	1. Record of number of qualified lecturers 2. Number of participants and the record of the activity 3. Result of the evaluation

Goals	Operations	Evaluation
4. Curriculum evaluation on the regular basis	1. Review the curriculum every 4 years 2. Set up database on the students, lecturers, and equipments as well as international collaboration 3. Conduct satisfaction assessment	1. Evaluate the result every 2 years by the internal committee 2. Evaluate the result every 4 years by the external committee

2. Instructional resources management

2.1 Budget management

Allocate annual budget (both from the government and the University's revenue budgets) to acquire permanent structures. Providing services and selling agricultural produces shall also be the source of revenue. Budget shall be allocated on the sensible basis for every subjects and monitoring on the expenditure in each subjects shall be implemented.

2.2 Existing instructional resources

The program in conjunction with the central library has appropriate and sufficient textbooks and other database resources. The faculty also possesses textbooks and other supportive materials which are sufficient for support teaching.

2.3 Procurement of additional instructional resources

University and faculty shall consider allocating sufficient resource for purchasing textbooks, academic journals and electronic database annually. The needfrom the full-time teaching staffs and special instructors for purchasing these academic materials shall be taken into consideration. The central library in conjunction with the faculty will be responsible for managing these resources for the students. The acquisition of laboratory instruments shall be acquired through careful planning.

2.4 Evaluation of resource adequacy

Arrange media facilities and convenience of use for instructors and evaluate instructor's media demand and media sufficiency as the details below:

Goals	Operations	Evaluation
Provide lecture, laboratory and farm facilities to support the teaching-learning in both classroom and field setting.	Equip the lecture, laboratory and farm with modern equipments in line with the international standard to provide effective learning and research.	1. Compile data regarding to the use of laboratory and/or equipment/student. 2. Compile data regarding the number of the students who use the teaching facilities. 3. Evaluate the satisfaction of the students who use these resources.
2. Provide main network and other internet facilities to effectively support the self-learning activities outside the classroom	1. Provide multimedia facilities to record the teaching and create teaching materials 2. Provide enough computing facilities for the effective self-learning 3. Provide sufficient academic resources, such as textbooks, journals, and multimedia in digital format for effective self-learning by the students	1.Compile the data regarding the number of equipment, laboratory usage in hours/student and the speed of network/student 2.Compile the data regarding the number of students who use computer 3.Compile the data with respect to the number of textbooks and multimedia 4.Survey student satisfaction in the use of these facilities

3. Teaching-staff management

3.1 New instructor recruitment

Selection of new instructors shall be in accordance with the University's regulation and criteria.The new teaching staffs shall have Ph.D. qualification pertinent to the qualification needed by the program. The candidates shall be required to present their research in the conference and subject to interview by the committee. The committee shall also take the view from the teaching staffs into consideration in recruiting the staffs.

3.2 Teaching staff's participation in curriculum planning, monitoring and review

The meeting shall be organized to convene the head of the curricular academic committee and the lecturers in order to plan, evaluate and revise (both for teaching each subject and for assessing the whole curriculum) as specified and required by the academic assurance. In case of curricular revision, the committee composing of the teaching staffs, shall be responsible for monitoring the development of curriculum.

3.3 Appoint of special teaching staff

Special instructors are deemed highly important for their ability to transfer direct and practical experiences to students. The faculty has the following policies for the invitation of special instructors:

(1) They must be persons with direct experiences, expertise or holding not less than M.Sc. education qualification.

(2) Invitation of special instructors must be screened by the program's administrative committee. Submission of their curriculum vitae and previous works those are relevant to the topics or the course that they are invited to teach is required.

(3) Invitation of special instructors must be planned at least 1 semester in advance.

(4) A performance evaluation of a special instructor must be carried out for each invited lecture each semester or every time that the course is taught by a special instructor.

4. Administration of instruction support personnel

4.1 Job specification

Job specification for each position must be in accordance with the faculty's needs and university's policies.The supporting staffs shall possess at least Bachelor Degree which is pertinent to the job requirement and possess the knowledge relevant to the curriculum.

4.2 Operation knowledge and skills promotion

(1) Allocate budget to endorse institutional research and organization development research.

(2) Include institutional research finding, data on organizational needs analysis, and the need for personnel development that is consistent with the organization development in an annual operational plan to secure the faculty's budgetary support.

(3) Arrange special training relevant to the task for the staffs such as laboratory preparation to support the learning-teaching process effectively.

5. Student assistant and consultation

5.1 Academic advice and other consultations

(1) The faculty appoints academic committees to provide supervision for each student.

(2) The supervisor must allocate the time and arrange the advisory session to the students which must be posted in the supervisor office as well as in the faculty website.

(3) Provide consultation service to the students with respect to extracurricular activity.

(4) Provide consultation service to the students regarding the good lifestyle which should be conducted in the university.

5.2 Student's appeal

In the case that student have doubt about an assessment of any course they can make a written request to view their answer sheets, scores, and instructor's assessment method in each course.

6. Job market and social needs and/or users satisfaction

(1) Conduct survey to obtain employment and further education in more advanced degree after one of graduation.

(2) Conduct survey to obtain the satisfaction of employer with respect to the quality of the graduates, in which the data will be used for improving the curriculum.

7. Key Performance Indicators

7.1 Key Performance Indicators for Curriculum outcome

7.1.1 Plan 1.1and 2.1 (3-year program)

Types of indicator: Process

Standard criteria: Level

Key Performance Indicators	2015	2016	2017	2018
1. Not less than 50% of the tenured instructors participate in the planning, monitoring, and review of curriculum performance	X	X	X	X
2. Curriculum details provided in the TQF2 are consistent with the national qualification standard	X	X	X	X
3. Complete details of all offered courses in the TQF3 prior to instruction commencement	X	X	X	X
4. Prepare performance outcome report of courses in accordance with TQF5 within 30 days after the semester has ended	X	X	X	X
5. Prepare performance outcome report of the curriculum in accordance with TQF7 within 60 days after the academic year has ended	X	X	X	X

Key Performance Indicators	2015	2016	2017	2018
6. Review student's achievement at least 25% of the offered courses in each semester in accordance with the learning outcome specified in TQF3	X	X	X	X
7. Development/improve instructional process, teaching strategies or learning performance outcome based on the performance evaluation results reported in last year TQF7		X	X	X
8. All new instructor (if Any) will receive orientation or advice on instructional management	X	X	X	X
9. All tenure instructors receive academic development training at least once a year	X	X	X	X
10. Not less than 50% of instructional support personnel (if any) receive academic and/or professional development training each year	X	X	X	X
11. The average level of senior students and new graduates' satisfaction for the quality of the curriculum is not less than 3.5 from the total score of 5.0			X	X
12. The level of employer's satisfaction is not less than 3.5 from the total score of 5.0				X
Total numbers of compulsory Key Performance Indicators (No.1-5) in each year	5	5	5	5
Total number of key performance indicators in each year	9	10	11	12

7.1.2 Plan 1.2 and 2.2 (5-year program)

Types of indicator: Process

Standard criteria: Level

Key Performance Indicators	2015	2016	2017	2018	2019	2020
1. Not less than 50% of the tenured instructors participate in the planning, monitoring, and review of curriculum performance	X	X	X	X	X	X
2. Curriculum details provided in the TQF2 are consistent with the national qualification standard	X	X	X	X	X	X
3. Complete details of all offered courses in the TQF3 prior to instruction commencement	X	X	X	X	X	X
4. Prepare performance outcome report of courses in accordance with TQF5 within 30 days after the	X	X	X	X	X	X

Key Performance Indicators	2015	2016	2017	2018	2019	2020
semester has ended						
5. Prepare performance outcome report of the curriculum in accordance with TQF7 within 60 days after the academic year has ended	X	X	X	X	X	X
6. Review student's achievement at least 25% of the offered courses in each semester in accordance with the learning outcome specified in TQF3	X	X	X	X	X	X
7. Development/improve instructional process, teaching strategies or learning performance outcome based on the performance evaluation results reported in last year TQF7		X	X	X	X	X
8. All new instructor (if any) will receive orientation or advice on instructional management	X	X	X	X	X	X
9. All tenure instructors receive academic development training at least once a year	X	X	X	X	X	X
10. Not less than 50% of instructional support personnel (if any) receive academic and/or professional development training each year	X	X	X	X	X	X
11. The average level of senior students and new graduates' satisfaction for the quality of the curriculum is not less than 3.5 from the total score of 5.0				X	X	X
12. The level of employer's satisfaction is not less than 3.5 from the total score of 5.0					X	X
Total numbers of compulsory Key Performance Indicators (No.1-5) in each year	5	5	5	5	5	5
Total number of key performance indicators in each year	9	10	10	11	12	12

Evaluation criteria

Qualified curriculum must pass the standard qualification as following:

Compulsory KPIs (1-5) have been accomplished according to the objectives with no less than 80% of the compulsory and total KPIs in each year.

Plan 1.1 and 2.1 (3-year program)

Academic year	Curriculum recognized by the standard qualification
2015	Attain obligatory KPIs 1-5 with overall accomplishment in 9 KPIs
2016	Attain obligatory KPIs 1-5 with overall accomplishment in 10 KPIs
2017	Attain obligatory KPIs 1-5 with overall accomplishment in 11 KPIs
2018	Attain obligatory KPIs 1-5 with overall accomplishment in 12 KPIs

Plan 1.2 and 2.2 (5-year program)

Academic year	Curriculum recognized by the standard qualification
2015	Attain obligatory KPIs 1-5 with overall accomplishment in 9 KPIs
2016	Attain obligatory KPIs 1-5 with overall accomplishment in 10 KPIs
2017	Attain obligatory KPIs 1-5 with overall accomplishment in 10 KPIs
2018	Attain obligatory KPIs 1-5 with overall accomplishment in 11 KPIs
2019	Attain obligatory KPIs 1-5 with overall accomplishment in 12 KPIs
2020	Attain obligatory KPIs 1-5 with overall accomplishment in 12 KPIs

Section 8 Curriculum evaluation and revision

1. Teaching Efficiency Assessment

1.1 Evaluation of Teaching Strategy

(1) Evaluate from the participation of students in class discussions such as raising questions and putting forward arguments as well as from their ability in writing research papers and theses.

(2) Carry out formal evaluation for each course.

1.2 Evaluation of Proficiency in Applying Teaching Strategy

(1) Students evaluate teaching performance of each professor/lecturer in each course at the end of the course by answering the questionnaire set by the Coordinating Committee.

(2) Respective professors/lecturers and Head of Curriculum shall be informed of the evaluation results for consideration and improvement in teaching performance.

(3) The Coordinating Committee shall compile the comments concerning changes that need to be made in order to plan for improvement of teaching strategies.

2. Overall Evaluation of the Curriculum

The faculty shall arrange the assessment of the curriculum for improvement every 5 academic year in order to have the curriculum which is modern in line with the need of the country.

3. Evaluation of Performance According to Requirement Details of the Curriculum

There will be an annual internal academic assurance conducted by the appointed internal committee. The standard for evaluation will base upon a manual for an internal academic assurance for higher education (2014 edition) issued by the Office of Higher Education and/or its subsequent modified standard version.

All curriculums must be periodically updated and the evaluation for curricular development must be executed every 5 years.

4. Reviewing Assessment Results and Planning for Revision of the Curriculum

(1) The lecturers shall review the teaching evaluation given by the students, after which action should be taken to address the problems based upon the evaluation. The final report shall be submitted to the Head of the Department through the Head of curricular academic committee.

(2) The curricular academic committee shall monitor the implementation to achieve KPI in section 7 point 7 in accordance with the internal quality assurance.

(3) The curricular academic committee shall compile the teaching outcome and report the evaluation of teaching. It will also report the evaluation of the curriculum and the internal quality assurance as well as the views given by the external experts. All this shall be submitted for the Head of the Department.

(4) The curricular academic committee shall convene to review the implementation of the curriculum, in which the views from the external experts shall be used to plan for improvement in the next academic semester. The report shall be prepared for the Dean for consideration.

4.1 Amending courses

Amending or modifying courses based on results from the evaluation may be approved directly by the Coordinating Committee if the changes are minor and do not affect the structure of the curriculum.

4.2 Revising the entire curriculum

Entire overhaul of the curriculum is considered to be a major change affecting the structure of the curriculum and therefore should be carried out every 5 years at the termination of each cycle of the curriculum so that it becomes up-to-date and responds to the demands of prospective employers of graduates. The process for this undertaking shall be as follows:

(1) The evaluation committee compiles a report on the assessment of the curriculum and points out issues that need amending.

(2) Organize a seminar for the purpose of updating the curriculum.

(3) Approach qualified individuals to review and give comments on the curriculum.

(4) Submit the newly revised curriculum to the academic and curriculum review committees for deliberation before proposing it to the University Council for final approval.