Master of Science Program in Bioscience for Sustainable Agriculture
(International Program/New Program 2015)

Faculty of Animal Sciences and Agricultural Technology

Program title Master of Science Program in Bioscience for Sustainable Agriculture (International Program)

Degree title Master of Science (Bioscience for Sustainable Agriculture)
M.Sc. (Bioscience for Sustainable Agriculture)

Place of instruction
Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Phetchaburi IT Campus

Objectives
1. To produce a holder of a master's degree capable in doing research in the field of Bioscience for Sustainable Agriculture
2. To develop human resource accommodated for the national and international government or Private Corporation requirements in the development of sustainable agriculture

Student qualifications
1. Plan A1 (Thesis)
   Graduates of Bachelor degree in science or related fields with an equivalent or with the decision and consent of the curricular academic committee
2. Plan A2 (Thesis and course works)
   Graduates of Bachelor degree in science or related fields with an equivalent GPA not less than 2.50
3. Eligible candidates under Clause 1 and 2 must have all the qualifications specified in Clause 7 of Silpakorn University’s Regulation on Graduate Study B.E. 2550 (2007).
4. 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.

Curriculum Structure

Plan A1
Seminar (non-credit) 3 credits
Thesis (equivalent to) 36 credits
Total 36 credits

Plan A2
Required courses 12 credits
Elective courses (not less than) 12 credits
Thesis (equivalent to) 12 credits
Total (not less than) 36 credits

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

1. Plan A1

1.1 Seminar (non-credit) 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
715 507 Seminar I 1(1-0-2)
715 508 Seminar II 1(1-0-2)
715 509 Seminar III 1(1-0-2)

1.2 Thesis (equivalent to) 36 credits
715 591 Thesis (equivalent to) 36 credits

2. Plan A2

2.1 Required Courses 12 credits
715 501 Cell Science and Molecular Biology 3(3-0-6)
715 502 Bioscience for Agricultural Sustainability 3(2-3-4)
715 503 Research Methodology and Applied Bioscience for Agricultural Sustainability
715 504 Seminar I 1(1-0-2)
715 505 Seminar II 1(1-0-2)
715 506 Seminar III 1(1-0-2)

2.2 Elective courses (not less than) 12 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.
715 521 Animal Genetic Improvement and Conservation 3(3-0-6)
715 522 Biotechnology for Sustainable Animal Production 3(2-3-4)
715 523 Farming System Management in Integrated Animal Production 3(3-0-6)
715 524 Laboratory Animal Management and Welfare 3(2-3-4)
715 525 Hygiene in Dairy Production 3(3-0-6)
715 526 Nutraceuticals in Animal Health and Production 3(3-0-6)
715 527 Diagnosis of Aquatic Animal Diseases 3(2-3-4)
715 528 Ecology and Management of Aquatic Resources 3(3-0-6)
715 529 Selective Breeding of Aquatic Animals 3(3-0-6)
715 530 Genetic Improvement for Crop production 3(3-0-6)
715 531 Integrated Pest Management 3(2-3-4)
715 532 Microbial Diversity and Application 3(2-3-4)
715 533 Plant Genetic Resource and Application 3(3-0-6)
715 534 Postharvest Physiology and Technology 3(2-3-4)
715 535 Seed Technology 3(2-3-4)
715 536 Soil Fertility and Integrated Soil Resource Management 3(2-3-4)
715 537 Natural Resources and Management 3(3-0-6)
715 538 Advanced Plant Pathology 3(2-3-4)
715 539 Biological Control of Insect Pests 3(2-3-4)
715 540 Insect Biotechnology 3(3-0-6)
715 541 Selected Topics in Bioscience for Sustainable Agriculture 3(3-0-6)
2.3 Thesis (equivalent to) 12 credits
715 592 Thesis (equivalent to) 12 credits

Course Descriptions
715 501 Cell Science and Molecular Biology 3(3-0-6)
   Cell structure and function, structure of genetic materials, DNA replication, cell cycle, cell division, gene expression, gene regulation, cell differentiation, mutation, cell-cell communication, energy flow in biosystem, basic technique in molecular biology.

715 502 Bioscience for Agricultural Sustainability 3(2-3-4)
   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.

715 504 Seminar I 1(1-0-2)
   Criteria: For student enrolled in plan A2.
   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.

715 505 Seminar II 1(1-0-2)
   Criteria: For student enrolled in plan A2.
   Pre-requisite: 715 504 Seminar I
   Searching, compiling the information, discussion and presentation of research in bioscience for sustainable agriculture.

715 506 Seminar III 1(1-0-2)
   Criteria: For student enrolled in plan A2.
   Pre-requisite: 715 505 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.

715 507 Seminar I 1(1-0-2)
   Criteria: For student enrolled in plan A1.
   Assessment will be given as S or U.
   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.
715 508  Seminar II  1(1-0-2)
Criteria: For student enrolled in plan A1.
Assessment will be given as S or U.
Pre-requisite: 715 507 Seminar I
Searching, compiling the information, discussion and presentation of research in bioscience for sustainable agriculture.

715 509  Seminar III  1(1-0-2)
Criteria: For student enrolled in plan A1.
Assessment will be given as S or U.
Pre-requisite: 715 508 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.

715 521  Animal Genetic Improvement and Conservation  3(3-0-6)
Biodiversity, animal genetic resources, domestic animal diversity, loss of genetic diversity in domestic animals, reasons and criteria for breed selection and conservation, methods for conservation of animal genetic diversity, status of breeds, concepts and principles in genetic improvement of livestock.

715 522  Biotechnology for Sustainable Animal Production  3(2-3-4)
Constraints in production process, health management, welfare and waste from household animal productions, small farms and large farms, use of biotechnology in mitigating the constraints in production process, health management, welfare and waste from animal productions for sustainable animal production.

715 523  Farming System Management in Integrated Animal Production  3(3-0-6)
Models and management of animal production process in integrated agriculture, interactions among crops, animals and aquatic animals under appropriate agro-ecosystems.

715 524  Laboratory Animal Management and Welfare  3(2-3-4)
Management and care of laboratory animals, health management and laboratory animal ethic, animal restraint, animal constraints, techniques pertaining to anesthesia, euthanasia and necropsy.

715 525  Hygiene in Dairy Production  3(3-0-6)
Factors affecting milk quality, milking parlor design and management, milking systems and analysis, milking machine, mastitis and milk quality management, waste management from dairy farm.

715 526  Nutraceuticals in Animal Health and Production  3(3-0-6)
Principles of threpsology, role of nutraceuticals, functional foods and dietary supplements on animal health and diseases, discussion about these products, application of nutraceuticals and functional foods from natural sources as being part of animal feed.
715 527  Diagnosis of Aquatic Animal Diseases  3(2-3-4)
Common and emerging infectious diseases in wild and farmed aquatic animals, diagnostic tools used in disease diagnosis, pathological and molecular diagnostic procedures for bacterial and viral infections in aquatic animals.

715 528  Ecology and Management of Aquatic Resources  3(3-0-6)
Ecology of aquatic ecosystems, resource use and related environmental issues, ecological concepts, principles and application in conservation and restoration of aquatic resources.

715 529  Selective Breeding of Aquatic Animals  3(3-0-6)
Concept of quantitative genetics and selective breeding for quantitative traits in aquatic animals, genetic variation, statistical methods for measures of phenotypic variation, environmental effects, genotype-environment interactions, molecular marker and genetic map, quantitative trait loci analysis, marker-assisted selection, design of selective breeding program for genetic improvement of aquaculture species.

715 530  Genetic Improvement for Crop Production  3(3-0-6)

715 531  Integrated Pest Management  3(2-3-4)
Definition of pests, key historical events in pest outbreak, effect of pest outbreak to agriculture, pest control tactics, integrated pest management (IPM) concept, components and steps of IPM, sampling techniques and decision tool of IPM, examples of IPM in current practices.

715 532  Microbial Diversity and Application  3(2-3-4)
Habitat of microbe, isolation and identification of microbes, detection and utilization of potential microbes for plant production in sustainable agriculture, types of plant-microbe association, factors affecting plant-microbe association, utilization of microbes for plant production in adverse environment, production, product formulation and commercialization of beneficial microbe for plant production.

715 533  Plant Genetic Resource and Application  3(3-0-6)

715 534  Postharvest Physiology and Technology  3(2-3-4)
Causes of loss in post-harvest products, physiology of maturity, ripening, and senescence, genetic control of maturity, ripening, and senescence, post-harvest loss, prevention of post-harvest loss, insect pests and diseases of post-harvest products.
715 535  Seed Technology  3(2-3-4)
Seed morphology and physiology of seed under storage and germination, process of seed production, methods in determining seed quality, seed pathology and insect pests of seed, techniques used in seed storage.

715 536  Soil Fertility and Integrated Soil Resource Management  3(2-3-4)
Nutrient and organic matter recycling in soil, soil fertility analysis, plant-soil-microbe interaction, method of measuring the status of soil fertility, methods of enhancing the status of soil fertility for crop production in sustainable agriculture.

715 537  Natural Resources and Management  3(3-0-6)
Approaches in natural resource management, stakeholder analysis for natural resource management, Geographic Information Systems (GIS), auditing systems for natural resource management, biodiversity conservation.

715 538  Advanced Plant Pathology  3(2-3-4)
Definition of plant diseases, history of plant disease outbreak of important economic crops, types of microorganisms causing diseases in plants, mechanisms of plant defense, important diseases of economic plants, principles of plant disease management and tactics for plant disease control, biotechnology in plant pathology, appropriate technology for controlling plant diseases in sustainable crop production.

715 539  Biological Control of Insect Pests  3(2-3-4)
History and development of biological control of insects, natural enemies of insect pests, strategies for using natural enemies, concerns, changes, and challenges of biological control.

715 540  Insect Biotechnology  3(3-0-6)
Insect molecular genetics, biotechnological approaches in entomology, applications of insect biotechnology, biotechnology and integrated pest management.

715 541  Selected Topics in Bioscience for Sustainable Agriculture  3(3-0-6)
Topics of current interest in bioscience for sustainable agriculture.

715 591  Thesis  (equivalent to) 36 credits
Criteria: For student enrolled in plan A1.
Original research dissertation undertaken under guidance of advisor(s).

715 592  Thesis  (equivalent to) 12 credits
Criteria: For student enrolled in plan A2.
Original research dissertation undertaken under guidance of advisor(s).
Graduation criteria

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

2. Comply with the conditions and rules of the curriculum as follows:
   2.1 Passed (Obtain “S”) the comprehensive examination
   2.2 Thesis or part of the thesis conducted has been accepted for publication in the national peer-reviewed journal/transaction at least 1 paper or present thesis/part of the thesis in the international conferences with full-paper published in the conference proceeding at least 1 paper.
   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.