

Course Detail

Master of Science Program in Animal Science

- 1. Course Title:** Master of Science Program in Animal Science
- 2. Master Degree:** Master of Science (Animal Science)
(M.S. (Animal Science))
- 3. Academic Institution:** Faculty of Agriculture, Natural Resources and Environment, Naresuan University
- 4. Duration:** June 2025-May 2027
- 5. Background and Rational:** Master of Science Program in Animal Science

5.1 Program Philosophy

“Animal Science is the science of creating knowledge and innovation along with research integration to meet the animal production requirement”

5.2 The importance of the programme

According to the BCG economy model (Bio-Economy, Circular Economy, and Green Economy) that Thailand adapts to encourage the country’s development as well as a 3s (Safety-Security-Sustainability)—the agriculture and food policy of the Ministry of Agriculture and Cooperatives aims to make Thailand be a kitchen of the world. Moreover, the environmental problem, climate change, and coronavirus disease 2019 (COVID-19) pandemic affect agriculture and food security, and sustainability. The animal production industry is one of the key sectors that enhance the development and policy of the country. Therefore, study and research in Animal Science such as Poultry, Swine, Ruminant Production, Meat Science and Technology, and Standard of Animal Production and Products Safety, is one of the important disciplines for food safety, food security, and sustainability as well as the development of the country.

5.3 Academic staff of Division of Animal Science

Name-Surname	Education
Assoc. Prof. Dr. Wandee Tartrakoon	Dr. Sc. Agr. (Animal Production), Georg-August-University Gottingen, Germany
Assoc. Prof. Dr. Tossaporn Incharoen	Ph.D. (Animal Science) , Ehime University, Japan
Asst. Prof. Dr. Noraphat Hwanhlem	Ph.D. (Biotechnology), Prince of Songkla University, Thailand

Asst. Prof. Dr. Rangsun Charoensook	Ph.D. (Molecular Animal Breeding and Animal Biotechnology), Georg-August University of Goettingen, Germany
Asst. Prof. Dr. Sonthaya Numthuam	Ph.D. (Bioindustrial Sciences), University of Tsukuba, Japan
Asst. Prof. Dr. Pattaraporn Tatsapong,	Ph.D. (Animal Production Technology), Suranaree University of Technology, Thailand
Asst. Prof. Dr. Wilasinee Inyawilert	Ph.D. (Animal Science), National Chung Hsing University, Taiwan
Asst. Prof. Dr. Niran Aeksiri	Ph.D. (Genetic Engineering), Kasetsart University, Thailand
Asst. Prof. Dr. Amornrat Wanangkarn	Ph.D. (Animal Science), National Chung Hsing University, Taiwan
Dr. Kunlayaphat Wuthijaree	Ph.D (Management of Mountain Environment and Agriculture), Free University of Bozen-Bolzano, Italy

6. Objectives:

The main goal of the Master of Science Program in Animal Science is: Students will gain broad and creative knowledge, innovative creation, and research integration of the Animal Science discipline to understand the current and future of the field as well as to meet the animal production requirement.

7. Course Synopsis and Methodology:

7.1 Study plan

There are 3 plans including plan A Type A 1, plan A Type A 2, and plan B as the followings:

List of programme	Credit of each plan		
	A Type A 1	A Type A 2	B
Course work	-	24	30
Thesis	36	12	-
Independent study	-	-	6
Non-credit course work	5	5	5
Total credit (not less than)	36	36	36

- Plan A Type A 1

1) Thesis	not less than	36 credits
121590 Thesis 1, Type A 1		9 credits
121591 Thesis 2, Type A 1		9 credits
121592 Thesis 3, Type A 1		9 credits
121593 Thesis 4, Type A 1		9 credits
2) Non-credit course work		5 credits
121500 Seminar 1		1(0-2-1)
121501 Seminar 2		1(0-2-1)
121502 Research Methodology in Science and Technology		3(3-0-6)

- Plan A Type A 2

1) Course work	not less than	3 credits
121510 Standard of Animal Production and Products Safety		3(2-2-5)
2) Elective Courses	not less than	21 credits
121520 Avian Physiology		3(2-2-5)
121521 Advanced Animal Reproductive Physiology		3(2-2-5)
121522 Ruminant Physiology		3(2-2-5)
121523 Physiology of Lactation		3(2-2-5)
121524 Domestic Animal Metabolism		3(2-2-5)
121525 Animal Reproductive Biotechnology		3(2-2-5)
121526 Molecular Biology of Reproduction		3(2-2-5)
121527 Protein and Proteomics for Science and Technology		3(2-2-5)
121530 Molecular Animals Breeding		3(2-2-5)
121531 Molecular Systematics in Domestic Animals		3(2-2-5)
121532 Population Genetics in Animals		3(2-2-5)
121540 Advanced Monogastric Animal Nutrition		3(2-2-5)
121541 Advanced Poultry Nutrition		3(2-2-5)
121542 Advanced Swine Nutrition		3(2-2-5)
121543 Advanced Ruminant Nutrition		3(2-2-5)
121550 Tropical Animal Feed Resources		3(2-2-5)
121551 Phytochemical Application in Livestock Production		3(2-2-5)
121552 Advanced Feed Technology		3(2-2-5)
121553 Advanced Analysis of Feed and Livestock Product		3(2-2-5)

121554	Feed Additives and Supplements	3(2-2-5)
121560	Advanced Poultry Science	3(2-2-5)
121561	Advanced Swine Science	3(2-2-5)
121562	Advanced Monogastric Animal Production	3(2-2-5)
121563	Tropical Animal Production Systems	3(2-2-5)
121564	Information System for Animal Production	3(2-2-5)
121565	Application of Computer Technology in Animal Production	3(2-2-5)
121566	Application of Near Infrared Spectroscopy for Livestock Production	3(2-2-5)
121567	Advanced Dairy Farm Management	3(2-2-5)
121568	Advanced Beef Cattle Farm Management	3(2-2-5)
121569	Environmental and Animal Waste Management	3(2-2-5)
121570	Advanced Meat Science and Technology	3(2-2-5)
121571	Quality Assurance System in Meat Processing Industry	3(2-2-5)
121572	Microbiology of Animal Products	3(2-2-5)
121573	Current Topic in Animal Products	3(2-2-5)
121574	Animal Products	3(2-2-5)
121575	Applied Microbiology and Biotechnology for Animal Science	3(2-2-5)
121576	Animal Science and the Current Situation of the World	3(2-2-5)
121580	Research Techniques in Poultry Science	3(2-2-5)
121581	Research Techniques in Swine Science	3(2-2-5)
121582	Research Techniques in Ruminants	3(2-2-5)
121583	Research Techniques in Meat Science	3(2-2-5)
121584	Research Techniques in Animal Nutrition	3(2-2-5)
121585	Research Techniques in Animal Genetics and Biotechnology	3(2-2-5)
121586	Research Techniques in Near Infrared Spectroscopy	3(2-2-5)
121587	Techniques in Cryopreservation of Gametes and Embryos of Animals	3(2-2-5)
121588	Literature Review in Animal Science	3(2-2-5)

121589	Selected Topics in Animal Science	3(2-2-5)
3) Thesis	not less than	12 credits

121594	Thesis 1, Type A 2	3 credits
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121595	Thesis 2, Type A 2	3 credits
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121596	Thesis 3, Type A 2	6 credits
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4) Non-credit course work		5 credits
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121500	Seminar 1	1(0-2-1)
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121501	Seminar 2	1(0-2-1)
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121502	Research Methodology in Science and Technology	3(3-0-6)
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- Plan B

1) Course work	not less than	3 credits
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121510	Standard of Animal Production and Products Safety	3(2-2-5)
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2) Elective Courses	not less than	27 credits
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121520	Avian Physiology	3(2-2-5)
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121521	Advanced Animal Reproductive Physiology	3(2-2-5)
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121522	Ruminant Physiology	3(2-2-5)
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121523	Physiology of Lactation	3(2-2-5)
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121524	Domestic Animal Metabolism	3(2-2-5)
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121525	Animal Reproductive Biotechnology	3(2-2-5)
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121526	Molecular Biology of Reproduction	3(2-2-5)
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121527	Protein and Proteomics for Science and Technology	3(2-2-5)
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121530	Molecular Animals Breeding	3(2-2-5)
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121531	Molecular Systematics in Domestic Animals	3(2-2-5)
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121532	Population Genetics in Animals	3(2-2-5)
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121540	Advanced Monogastric Animal Nutrition	3(2-2-5)
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121541	Advanced Poultry Nutrition	3(2-2-5)
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121542	Advanced Swine Nutrition	3(2-2-5)
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121543	Advanced Ruminant Nutrition	3(2-2-5)
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121550	Tropical Animal Feed Resources	3(2-2-5)
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121551	Phytochemical Application in Livestock Production	3(2-2-5)
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121552	Advanced Feed Technology	3(2-2-5)
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121553	Advanced Analysis of Feed and Livestock Product	3(2-2-5)
121554	Feed Additives and Supplements	3(2-2-5)
121560	Advanced Poultry Science	3(2-2-5)
121561	Advanced Swine Science	3(2-2-5)
121562	Advanced Monogastric Animal Production	3(2-2-5)
121563	Tropical Animal Production Systems	3(2-2-5)
121564	Information System for Animal Production	3(2-2-5)
121565	Application of Computer Technology in Animal Production	3(2-2-5)
121566	Application of Near Infrared Spectroscopy for Livestock Production	3(2-2-5)
121567	Advanced Dairy Farm Management	3(2-2-5)
121568	Advanced Beef Cattle Farm Management	3(2-2-5)
121569	Environmental and Animal Waste Management	3(2-2-5)
121570	Advanced Meat Science and Technology	3(2-2-5)
121571	Quality Assurance System in Meat Processing Industry	3(2-2-5)
121572	Microbiology of Animal Products	3(2-2-5)
121573	Current Topic in Animal Products	3(2-2-5)
121574	Animal Products	3(2-2-5)
121575	Applied Microbiology and Biotechnology for Animal Science	3(2-2-5)
121576	Animal Science and the Current Situation of the World	3(2-2-5)
121580	Research Techniques in Poultry Science	3(2-2-5)
121581	Research Techniques in Swine Science	3(2-2-5)
121582	Research Techniques in Ruminants	3(2-2-5)
121583	Research Techniques in Meat Science	3(2-2-5)
121584	Research Techniques in Animal Nutrition	3(2-2-5)
121585	Research Techniques in Animal Genetics and Biotechnology	3(2-2-5)
121586	Research Techniques in Near Infrared Spectroscopy	3(2-2-5)
121587	Techniques in Cryopreservation of Gametes and Embryos of Animals	3(2-2-5)
121588	Literature Review in Animal Science	3(2-2-5)
121589	Selected Topics in Animal Science	3(2-2-5)

	Total credits	9 credits
2) Plan A Type A 2		
Year 1		
First semester		
121500	Seminar 1 (Non-credit)	1(0-2-1)
121510	Standard of Animal Production and Products Safety	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
121502	Research Methodology in Science and Technology (Non-credit)	3(3-0-6)
	Total credits	12 หน่วยกิต
Second semester		
121501	Seminar 2 (Non-credit)	1(0-2-1)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
121594	Thesis 1, Type A 2	3 credits
	Total credits	12 credits
Year 2		
First semester		
1215xx	Elective Courses	3(2-2-5)
121595	Thesis 2, Type A 2	3 credits
	Total credits	6 credits
Second semester		
121596	Thesis 3, Type A2	6 credits
	Total credits	6 credits

3) Plan B

Year 1

First semester

121500	Seminar 1 (Non-credit)	1(0-2-1)
121510	Standard of Animal Production and Products Safety	3(2-2-5)

1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
121502	Research Methodology in Science and Technology (Non-credit)	3(3-0-6)
Total credits		12 credits
Second semester		
121501	Seminar 2 (Non-credit)	1(0-2-1)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
1215xx	Elective Courses	3(2-2-5)
Total credits		12 credits
Year 2		
First semester		
1215xx	Elective Courses	3(2-2-5)
121597	Independent Study 1	3 credits
Total credits		6 credits
Second semester		
1215xx	Elective Courses	3 (2-2-5)
121598	Independent Study 2	3 credits
Total credits		6 credits

7.3 Course Content

121500 Seminar 1 1(0-2-1)

Searching, collecting, and analyzing on research publications and reviews in animal science, business sector or livestock industry, and related topics to develop thesis topic and proposal oral presentation required.

121501 Seminar 2 1(0-2-1)

Searching, analyzing, criticizing and summarizing on research publications and reviews in animal science and related topics to develop thesis literature review and oral presentation in English.

121502 Research Methodology in Science and Technology 3(3-0-6)

Definition and objectives of research, research process, research categorization, statement of problem; variables, hypothesis, experimental design, data collection and data analysis are discussed; applications of computer and statistical program for data analysis for animal science research; proposal, report and manuscript writing; evaluation of research, interpretation, and research ethics.

121510 Standard of Animal Production and Products Safety 3(2-2-5)

Importance of safety issue in animal production, livestock farm standard, animal products standard, management of animal production system and products as well as regulation of animal production and products safety.

121520 Avian Physiology 3(2-2-5)

Importance of physiology on commercial avian production mechanisms and interrelationships of major physiological systems: nervous, skeleton, sensory, circulatory, respiratory, excretion, digestion and nutrient absorption, thermoregulatory, reproductive and immune systems.

121521 Advanced Animal Reproductive Physiology 3(2-2-5)

The structures and function of the reproductive system, regulation of reproduction (Nerves, hormone and Target Tissues) , gametogenesis, fertilization, embryogenesis, maternal recognition of pregnancy, placentation, and parturition.

121522 Ruminant Physiology 3(2-2-5)

Digestive system and physiology of ruminant, nutrient digestion, absorption and metabolism, regulation of feed intake in ruminants, control of salivation and motility of the reticulorumen, rumen microbiology and fermentation such as microbial adherence to the plant cell wall and enzymatic hydrolysis, physiology of ruminal nitrogen metabolism, study of reproduction,

pregnancy, lactation, tissue maintenance and utilization of endogenous body reserves, host resistance to parasites as pathogens in ruminants.

121523 สรีรวิทยาการให้นม 3(2-2-5)

Physiology of Lactation

Development of udder and mammary gland, anatomy and physiology of mammary gland, change of anatomy and physiology of mammary gland of stage of lactation, synthetic and secretory tissues of the mammary gland, milk composition and quality and hormone regulation of development of mammary gland, milk synthesis and ejection.

121524 Domestic Animal Metabolism 3(2-2-5)

Classification of carbohydrate, protein and lipid in animal nutrition and their function protein and nitrogen metabolism lipid metabolism and carbohydrate metabolism.

121525 Animal Reproductive Biotechnology 3(2-2-5)

Reproductive management, application of biotechnology for improving reproduction efficiency such as artificial insemination, estrous synchronization, embryo sexing, embryo culture, and embryo transfer.

121526 Molecular Biology of Reproduction 3(2-2-5)

The fundamental principles of molecular biology, general mechanisms and genes expressed during ovulation, spermatogenesis, fertilization, and implantation to all the farm animals.

121527 Protein and Proteomics for Science and Technology 3(2-2-5)

Amino acids, the three-dimensional structure of proteins, protein synthesis and turnover, protein expression and characterization, large-scale protein production, enzyme kinetics, enzyme structure, enzyme function, and enzyme catalysis, protein folding *in vivo* and *in vitro*, techniques of studying proteins and proteomics for animal sciences, and their application in industry.

121530 Molecular Animals Breeding **3(2-2-5)**

Principles and scope of molecular breeding and biotechnology in animals, molecular biology, molecular genetic techniques, molecular markers, candidate gene approach, gene expression, genome mapping and genome analysis.

121531 Molecular Systematics in Domestic Animals **3(2-2-5)**

The student will gain knowledge of molecular systematic research techniques in domestic animals involve the following stages: problem definition and research design, pilot studies (determination of molecular genetic marker), field survey and animal sampling, sample analysis by molecular genetic techniques (DNA extraction, PCR, sequencing, restriction enzyme analysis), data analysis, phylogenetic reconstruction and utilization of GenBank data base.

121532 Population Genetics in Animals **3(2-2-5)**

The constituent principles on population genetics, gene frequency and equilibrium, factors influencing the changes in gene frequency, quantitative characteristics on the improvement of animal breeding and the variation in genetic traits the estimation on heritability, repeatability, ultimate results on animal breeding improvement, genetic correlation coefficient in animal breeding improvement; single and multiple-trait selections and systems in animal breeding program.

121540 Advanced Monogastric Animal Nutrition **3(2-2-5)**

Nutrients, their metabolism and requirements for monogastric animal during different stages of growth and production quality control of feed ration for high efficient production nutrition in relation to disease and stress nutritional factors affecting quality of the products. hind gut fermentation and its importance, nutritional manipulation for special purpose.

121541 Advanced Poultry Nutrition **3(2-2-5)**

Nutrients, their metabolism and requirements for poultry during different stages of growth and production quality control of feed ration for high

efficient production nutrition adjustment for supporting factor changes such stress, disease and environmental alteration managements of nutritional factors for improvement of products quality and special purpose.

121542 Advanced Swine Nutrition 3(2-2-5)

Advanced knowledge on nutrient requirements of swine for various stages of production, the interrelationships among nutrition and other factors (environment, management, and health) that affect productive performance, feed efficiency, health and wellness advanced nutritional and feed technology to promote beneficial bacteria in the gut, improve overall gut integrity, and support a balanced immune system.

121543 Advanced Ruminant Nutrition 3(2-2-5)

Regulation of feed intake in ruminant, nutrient requirements of ruminants, feed quality evaluation, feed formulation, rumen fermentation, rumen metabolism and microbial protein synthesis, rumen micro-organisms activity and their nutrition.

121550 Tropical Animal Feed Resources 3(2-2-5)

Tropical animal feed resources, including availability, nutritional value and limitation, processing, nutritional value added and feed utilization.

121551 Phytochemical Application in Livestock Production 3(2-2-5)

Phytochemical is natural active substance derived from many kind of plant including phytohormones, pathogenic microorganism inhibition agents, immune stimulator, digestive enhancers, antihelminthics, antioxidants and natural pigments the objectives of phytochemical application is to improve the overall livestock performance.

121552 Advanced Feed Technology 3(2-2-5)

Current status of feed industry, feed and fodder processing, particle size reduction, processing of grains and oil seeds, processing of roughages, feed plant layout and design, feed plant management, storage of feeds, computer

based control system sanitation and pest management formulation of concentrates and premixes, liquid feed supplements solid state fermentation (SSF) technology codex alimentarius, HACCP.

121553 Advanced Analysis of Feed and Livestock Product **3(2-2-5)**

Principles and advanced analytical techniques of feed and livestock product quality including spectroscopy techniques, chromatography techniques, immunoassay, biosensor and genetic techniques.

121554 Feed Additives and Supplements **3(2-2-5)**

Roles and importance of feed Additive and supplements, research advancements invention of feed additive and supplements, various kinds of feed additives and supplements, advanced production technology, proper application of feed additives and supplements in different economic animals.

121560 Advanced Poultry Science **3(2-2-5)**

Biological and behavioral alterations of poultry concerning production performance advanced poultry Breeding system poultry house and equipment technology management of industrial eggs incubation advanced poultry feed and nutrition research technique on applied poultry science poultry diseases and bio-security system.

121561 Advanced Swine Science **3(2-2-5)**

Biological and behavioral alterations of swine concerning productive performance and animal welfare advanced swine breeding and selection swine house and equipment management and environmental management swine production planning advanced swine feed and nutrition swine diseases and prevention in tropical zone research technique on swine production and nutrition.

121562 Advanced Monogastric Animal Production **3(2-2-5)**

Advancement of modern technology for industrial poultry and swine productions, breeding, nutrition, feed, feeding and farm management animal

welfare of poultry and swine productions data collection for production efficiency analysis problems and solutions in poultry and swine productions in the tropics.

121563 Tropical Animal Production Systems 3(2-2-5)

The structure of animal production systems in the tropical country factors influencing the productivity efficiency of resource use, and product quality application of research in animal production.

121564 Information System for Animal Production 3(2-2-5)

Basic structure in information system, database system, data analysis, application of information system, expert system and decision support system for animal production include breed, feed and management.

121565 Application of Computer Technology in Animal Production 3(2-2-5)

Application of computer technology in animal production, livestock farm management, the calculation of feed formulation program, analyze farm production, management of database system for animal production, basic knowledge of mobile phone application development and application of package program, analysis and improvement of animal production using computer simulation models.

121566 Application of Near Infrared Spectroscopy for Livestock Production 3(2-2-5)

History and background of near infrared spectroscopy, principle and fundamentals of near infrared spectroscopy, applications of near infrared spectroscopy for quantitative and qualitative analysis of livestock production.

121567 Advanced Dairy Farm Management 3(2-2-5)

Modern innovation and technology for industrial dairy farm management, genetic improvement of dairy cattle for the tropics administration of reproduction, lactation and milking processes advanced technique in

evaluation of milk quality applied research in dairy science dairy cattle diseases and bio-security system.

121568 Advanced Beef Cattle Farm Management 3(2-2-5)

Planning for beef cattle production, opportunity and threat analysis for beef cattle production, case study from selected site, theoretical knowledge with some theoretical practice in beef production, genetic improvement of beef cattle for the tropical area, feeding management of beef cattle, farm management, farm waste management, application of research in beef cattle production.

121569 Environmental and Animal Waste Management 3(2-2-5)

Suitable environment for tropical animals, management techniques for suitable housing, animal waste and by products management for better environment.

121570 Advanced Meat Science and Technology 3(2-2-5)

Advanced study in physiological and biochemistry changes of muscle and meat, which effect on meat processing applying new techniques of processing technology to improve qualities and prolong shelf life of meat products.

121571 Quality Assurance System in Meat Processing Industry 3(2-2-5)

Quality control and assurance of meat processing factory, international food standard and food law in meat manufacturing operations.

121572 Microbiology of Animal Products 3(2-2-5)

Microorganisms in animal products, effects of food processing on the microflora, preventing spoilage and contamination of microorganisms in animal products and utilization of microorganisms to produce fermented foods.

121573 Current Topic in Animal Products 3(2-2-5)

A review, report and presentation of interesting and modern topic including contemporary situation, scientific findings and technology advancement of animal products such as meat, milk and eggs.

121574 Animal Products 3(2-2-5)

The storage, handling, selection and grading of raw materials from animal such as meat, milk and egg for fresh market or food-processing industry.

121575 Applied Microbiology and Biotechnology for Animal Science 3(2-2-5)

Definition and scope of microbiology and biotechnology, materials and equipment for microbiology and biotechnology and their application, research ethics on human and animal subjects, biosafety and biosecurity, food safety and food security, pathogenic microorganisms and detection of pathogenic microorganisms in livestock, probiotics, prebiotics and synbiotics and their application. Bioactive compounds and their application, bioprocess engineering and its application in animal production, bio-products from agricultural and agro-industrial waste and their application in animal production. Application of good manufacturing practice (GMP) in animal production, hazard analysis critical control point (HACCP) on microbiology in animal production, International organization for standardization (ISO) on microbiology and biotechnology in animal production.

121576 Animal Science and the Current Situation of the World 3(2-2-5)

The current situation in the world related to animal science including Pandemic and emerging diseases, Animal welfare, Alternative energy, Restricted resources (water, land, feed, air), Agricultural and agro-industrial waste, Bio, circular, and green economy (BCG economy), Socioeconomic dynamics and political issues, Terrorism, war, immigration and poverty, Trade barriers, Environmental problems and climate change, Biosafety and biosecurity, Food safety, food security, and sustainability, High nutritive and quality animal-derived foods, Alternative meat, Deep Tech (Deep Technology), Data management, Smart farming

121580 Research Techniques in Poultry Science 3(2-2-5)

Various techniques and procedures to analyze/ determine the biological and behavioural system of poultry relating with production performance, product quality, health, or other parameters to understanding the principles and experimental approaches to obtain the high quality results, high efficiency of data collection and analysis in addition, novel or modern techniques and tools can be applied to build the knowledge for development of poultry science based researches resulting in international acceptance.

121581 Research Techniques in Swine Science 3(2-2-5)

Various techniques and procedures to study productive performance for various stages of production, principles and experimental approaches to study feed efficiency, environmental management, including behavior studies, experimental approaches to become the standard parameters for productive performance evaluation, experimental design and environmental management to develop standardized research protocol for animal care and use for scientific research.

121582 Research Techniques in Ruminants 3(2-2-5)

Study of various technique and procedures to determine or analyze data and collection data, experimental design, with productive performance, health, meat and milk quality, nutrient requirements, evaluation of nutritive value of feed and forage crops, rumen microbe activity, estimation of microbial protein synthesis, or other parameters, to understanding the principles and experimental approaches to obtain the quality and standard results, and a modern techniques and new methodology cab be applied for ruminants research.

121583 Research Techniques in Meat Science 3(2-2-5)

Strategic research issue in meat science, research philosophies and methodologies, research design, problem and objective statements, advanced research methods in meat science, interdisciplinary synthesis covering.

121584 Research Techniques in Animal Nutrition 3(2-2-5)

Strategic research issue in animal nutrition, research philosophies and methodologies, research design, problem and objective statements, advanced research methods in animal nutrition, interdisciplinary synthesis covering.

121585 Research Techniques in Animal Genetics and Biotechnology 3(2-2-5)

Strategic research issue in animal nutrition; research philosophies and methodologies; research design; problem and objective statements; advanced research methods in animal nutrition; interdisciplinary synthesis covering.

121586 Research Techniques in Near Infrared Spectroscopy 3(2-2-5)

Principle of near infrared spectroscopy, fundamentals of near infrared spectrometer, research concept of near infrared spectroscopy, development of calibration model for quantitative and qualitative analysis, result interpretation and statistics for near infrared spectroscopy research.

121587 Techniques in Cryopreservation of Gametes and Embryos of Animals 3(2-2-5)

The principle of cryobiology, parameters of concern in cryobiology, operation method of animal gamete and embryo cryopreservation, as well as its application.

121588 Literature Review in Animal Science 3(2-2-5)

Synthesis scientific report from literature review or research studies in animal science for developing a research proposal, research projects and thesis.

121589 Selected Topics in Animal Science 3(2-2-5)

A study on a specific topic in animal science with a modern and interesting contents in animal science. In the overall, nature of information in the study should be analyzed, synthesis and discussed and reported using the

principles of academic research topics to be covered must be approved and under advisement from the assigned advisory committee.

121590 Thesis 1, Type A 1 9 credits

Study the elements of thesis, review literature and related research, and determine a thesis title.

121591 Thesis 2, Type A 1 9 credits

Develop a concept paper and prepare a summary of literature and related research synthesis.

121592 Thesis 3, Type A 1 9 credits

Develop research instruments and research methodology and prepare a thesis proposal in order to present it to the committee.

121593 Thesis 4, Type A 1 9 credits

Collect data, analyze data, prepare progress a report in order to present it to the thesis advisor, and prepare a full-text thesis and a research article in order to get it published according to the graduation criteria.

121594 Thesis 1, Type A 2 3 credits

Study the elements of thesis or thesis examples in the related field of study, determine a thesis title, develop a concept paper, and prepare a summary of literature and related research synthesis.

121595 Thesis 2, Type A 2 3 credits

Develop research instruments and research methodology and prepare a thesis proposal in order to present it to the committee.

121596 Thesis 3, Type A 2 6 credits

Collect data, analyze data, prepare progress report in order to present it to the thesis advisor, and prepare a full-text thesis and a research article in order to get it published according to the graduation criteria.

121597 Independent Study 1 **3 credits**

Determine independent study title in the related problem of animal science, study the elements of independent study or independent study examples in the related field of study, develop concept paper, and prepare the summary of literature and related research synthesis.

121598 Independent Study 2 **3 credits**

Collect data, analyze data, prepare progress report in order to present it to the independent study advisor, and prepare full-text thesis and research article in order to get published according to the graduation criteria.

8. Graduation Conditions:

Plan A Type A 1

- English test
- Oral thesis defense
- Proceeding or research article

Plan A Type A 2

- English test
- GPA >3.00
- Oral thesis defense
- Proceeding or research article

Plan B

- English test
- GPA >3.00
- Comprehensive Examination
- Oral presentation of independent study
- Proceeding or research article

9. Applicant Qualifications

9.1 Plan A Type A 1

- Applicant who graduated with B.S. in Animal Science, Animal Husbandry, Animal Production Technology, Feed Science and Technology, Agriculture, or Any Science Program that related to field of Animal Science with GPA. ≥ 3.00 and other qualifications in accordance with the notification of Naresuan University

10. Document Required

- Transcript
- Recommendation Letter
- English Test
- Research Proposal (3-5 pages A4)

11. Contact:

11.1 Asst. Prof. Dr. Noraphat Hwanhlem

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