

# Animal Sciences (ANSC)

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## **ANSC 101. Student Success Techniques - Animal and Equine Science. 1 Credit.**

This course is designed to ease the transition for new students. Students will learn skills and techniques used by successful college students. Topics will include: an overview of the animal and equine science programs, internship & study abroad opportunities, career opportunities, professional communication, as well as student success basics. Prereq: Animal Science and Equine Science majors only.

## **ANSC 102. Student Success Techniques - Animal Sciences with Pre-Veterinary Medicine Emphasis. 1 Credit.**

This course is designed to ease the transition for new students. Students will learn skills and techniques used by successful college students. Topics will include: an overview of the veterinary school requirements, options within the animal sciences program, professional communication, internship & study abroad opportunities, career opportunities, as well as student success basics. Prereq: Animal Science or Equine Science majors only.

## **ANSC 114. Introduction to Animal Sciences. 3 Credits.**

General principles of the livestock industry and relationships to mankind. 2 lectures, 1 two-hour laboratory.

## **ANSC 165. Animals and Human Health. 3 Credits.**

Students will explore the intersection among human, animal, and environmental health within the One Health framework, emphasizing models of disability, the human-animal bond, and the impact of animal-assisted interventions at the personal and societal levels.

## **ANSC 194. Individual Study. 1-5 Credits.**

## **ANSC 196. Field Experience. 1-15 Credits.**

## **ANSC 199. Special Topics. 1-5 Credits.**

## **ANSC 200. Introduction to Anthrozoology. 3 Credits.**

In this course students will be introduced to anthrozoology: the study of the interactions and relationships between humans and non-human animals. In this class we will explore the roles that non-human animals play in human society, considering the benefits that we humans receive and the responsibilities we have toward other species. Research findings involving human-animal interactions will be explored.

## **ANSC 201. Student Success Techniques - Nontraditional & Transfer Students. 1 Credit.**

This course is designed to ease the transition for student new to NDSU. The specific focus of this course will be dependent on the interests and needs of enrolled students. Some of the topics will include: an overview of the animal and equine science programs, internship & study abroad opportunities, career opportunities, professional communication, and student success basics. Prereq: Animal Science or Equine Science majors only.

## **ANSC 210. Introduction to Therapeutic Horsemanship. 3 Credits.**

This course will introduce students to perspectives of disabilities, how equine assisted activities may affect individuals with specific disabilities, how to select appropriate horses and adaptive equipment, and will include discussion on the history and current discipline of therapeutic horsemanship and related fields. F.

## **ANSC 218. Anatomy and Physiology of Domestic Animals. 3 Credits.**

This course is an introduction to the anatomy and physiology of common domestic animals with an emphasis on how the normal structure and functions of the body contribute to health. A systems approach will be used to explore the interactions and complexity of the body.

## **ANSC 219. Anatomy and Physiology Laboratory. 1 Credit.**

This laboratory course complements and reinforces lecture material presented in Anatomy and Physiology of Domestic Animals. It is an introduction to anatomy and physiology of common domestic animals with emphasis on how the normal structures and functions of the body contribute to health.

## **ANSC 220. Livestock Production. 3 Credits.**

General production and management of major meat and dairy animal species. Topics include production systems, feeding, facilities, health, economics, and marketing. 2 lectures, 1 two-hour laboratory.

## **ANSC 223. Introduction to Animal Nutrition. 2 Credits.**

Principles of feeding livestock and pets including digestive systems, nutrient characteristics, nutrient requirements, and feed sources used in formulating balanced rations.

## **ANSC 230. Meat Grading and Evaluation. 2 Credits.**

Evaluation and grading of carcasses and wholesale cuts of beef, pork, and lamb. Written explanation of decisions and comparisons. 2 three-hour laboratories. F.

## **ANSC 231. Livestock Evaluation. 2 Credits.**

The study of evaluating breeding and market livestock based on records, appearance, and soundness. 2 three-hour laboratories. Prereq: ANSC 240. F.

## **ANSC 232. Dairy Cattle Evaluation. 2 Credits.**

Visual appraisal and evaluation of dairy cattle. Type classification of dairy cattle. 2 three-hour laboratories. F.

## **ANSC 233. Junior Competitive Livestock Evaluation. 2 Credits.**

The study of evaluating breeding and market livestock based upon visual appraisal and performance records. The NDSU Junior Livestock Evaluation Team will be selected from students enrolled in ANSC 233. Students are admitted to the course by instructor approval. 2, three-hour laboratories plus hours arranged. Prereq: ANSC 240.

**ANSC 235. Equine Evaluation. 2 Credits.**

Detailed study of horse conformation, selection criteria, and judging standards for equine competitions. Emphasis will be placed on development of critical thinking, decision making, and oral presentation skills. 2 three-hour laboratories. May be repeated. Prereq: ANSC 260. F.

**ANSC 240. Meat Animal Evaluation and Marketing. 3 Credits.**

Relationship between live animal composition and meat product values. Introduction to basic muscle biology and effects of livestock practices on meat quality. 2 lectures, 1 two-hour laboratory.

**ANSC 241. Survey of Meat Science. 2 Credits.**

Introduction to aspects of fresh and processed meat technology. Co-reqs: ANSC 243, ANSC 244, ANSC 245.

**ANSC 243. Slaughter and Processing of Domestic Livestock. 4 Credits.**

This course will teach the principles and procedures of meat animal humane slaughter, carcass fabrication, and meat processing. You will be required to help in all processes of slaughter, fabricating, processing, and cleaning. Prereq: Students must be in the North Dakota College of Science Meat Processing certificate program. Co-req: ANSC 241, ANSC 244, ANSC 245.

**ANSC 244. Value-added Meats Processing. 2 Credits.**

An investigation of factors involved in the production of processed and value-added meat products by hands-on training and classroom instruction. Prereq: Students must be enrolled in the North Dakota State College of Science meat processing certificate program. Co-req: ANSC 241, ANSC 243, ANSC 245.

**ANSC 245. Hazard Analysis and Critical Control Points. 2 Credits.**

Students will become familiar with hazard analysis, critical control point and food safety plans, including good manufacturing practices and standard operating procedures for safe food production. Prereq: Student must be enrolled in North Dakota State College of Science meat processing program. Co-req: ANSC 241, ANSC 243, ANSC 244.

**ANSC 260L. Equine Care and Management Practicum. 1 Credit.**

A laboratory course designed to supplement lecture material covered in ANSC 260. Students will learn management and husbandry skills relevant to modern horse care practices. 1 two-hour laboratory. F,S.

**ANSC 260. Introduction to Equine Studies. 2 Credits.**

Introduction to basic aspects of equine studies and general principles surrounding the horse industry. 2 one-hour lectures. F.

**ANSC 261. Basic Equitation & Horsemanship. 1 Credit.**

Basic grooming, saddling, bridling, mounting, ground work, correct riding position, and proper coordination of the riding aids will be addressed. Horse behavior will also be discussed throughout the course. 1 two-hour laboratory. Lab fee required. Enrollment priority will be given to Equine Studies Major/Minor/Certificate students.

**ANSC 265L. Principles of Equine Assisted Services Lab. 2 Credits.**

This course is focused on the application of theoretical knowledge of equine assisted services through experiential learning techniques. Prereq: ANSC 165 and ANSC 261.

**ANSC 291. Seminar. 1-5 Credits.**

**ANSC 292. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

**ANSC 294. Individual Study. 1-5 Credits.**

**ANSC 296. Field Experience. 1-15 Credits.**

**ANSC 299. Special Topics. 1-5 Credits.**

**ANSC 300. Domestic Animal Behavior and Management. 3 Credits.**

Discussion of animal behavior, with an emphasis on physiology, as it relates to management, handling and housing of domestic animals. Basic methods of measuring behavior are explored. Prereq: ANSC 114, VETS 135.

**ANSC 312. Bovine Pregnancy Diagnosis and Ultrasonography. 1 Credit.**

The course will involve the anatomy and physiology of the bovine. Utilization of techniques to determine pregnancy and ultrasonography will be instructed. Prereq: ANSC 463.

**ANSC 314. Animal Biotechnology. 3 Credits.**

Animal biotechnology, biotechnology in human health, biotechnology in reproduction, and biotechniques. Prereq: BIOL 126 or BIOL 150.

**ANSC 323. Fundamentals of Nutrition. 3 Credits.**

Fundamentals of nutrition emphasizing digestion, metabolism, function, requirements, and sources of specific nutrients. 3 lectures. Recommended Prereq: ANSC 123, BIOC 260. S.

**ANSC 324. Applied Animal Nutrition. 3 Credits.**

The application of nutrition principles in feed management systems for livestock, poultry, and pets. Prereq: ANSC 323.

**ANSC 330. Competitive Meat Grading and Evaluation. 2 Credits.**

Senior meat judging team. Team members will travel to intercollegiate meat judging contests. May be repeated. Prereq: ANSC 230.

**ANSC 331. Competitive Livestock Evaluation. 2 Credits.**

Evaluation of breeding and market livestock with an emphasis on preparing students for judging competition. 3 three-hour laboratories plus additional times to be arranged. May be repeated. Prereq: ANSC 231.

**ANSC 332. Competitive Dairy Cattle Evaluation. 2 Credits.**

Visual appraisal and evaluation of dairy cattle for competition at national dairy evaluation contests. 2 three-hour laboratories plus time to be arranged. Prereq: ANSC 232 and a minimum cumulative 2.0 GPA. May be repeated for credit.

**ANSC 340. Principles of Meat Science. 3 Credits.**

Introduction to the anatomical, physiological, developmental, and biochemical aspects conversion of muscle to meat and aspects of fresh and processed meat technology, preservation, microbiology, and current issues. 2 lectures, 1 two-hour laboratory.

**ANSC 344. Fundamentals of Meat Processing. 2 Credits.**

Chemical and physical relationships in meat preservation, sausage production, and other meat product preparation. 1 lecture, 1 three-hour laboratory.

**ANSC 350. Graduate Experience Program. 1 Credit.**

This course is designed to give undergraduate students the opportunity to explore graduate studies in the Animal Sciences. Undergraduates are paired with a graduate student mentor and participate in data collection, lab work, departmental seminars, journal article presentations, and scientific meetings.

**ANSC 357. Animal Genetics. 3 Credits.**

Genetic and statistical principles applied to livestock improvement. 2 lectures, 1 two-hour laboratory. Prereq: PLSC 315, STAT 330. S.

**ANSC 358. Equine Genetics. 2 Credits.**

Genetic principles applied to horses including: genetic improvement programs, genetic defects, color inheritance, inbreeding, domestication and breeds. Prereq: BIOL 315 or PLSC 315. F.

**ANSC 360. Equine Nutrition. 3 Credits.**

This course focuses on basic equine nutrition fundamentals while integrating concepts in an applied and practical manner. Recommended Prereq: ANSC 223 or ANSC 323.

**ANSC 361. Intermediate Horsemanship. 1 Credit.**

A continuation of ANSC 261. Further emphasis will be placed on development of the balanced seat and coordinated aids necessary to complete more advanced maneuvers. 1 two-hour laboratory. Lab fee required. Enrollment priority will be given to Equine Studies Major/Minor/Certificate students. Prereq: ANSC 261.

**ANSC 362. Colts in Training. 2 Credits.**

Principles and application of techniques required to train a young horse to ride. Three two-hour laboratories. Enrollment priority will be given to equine studies major/minor students. Lab fee required. Recommended prereq: ANSC 261, ANSC 361. S.

**ANSC 364. Equine Anatomy and Physiology. 3 Credits.**

This course focuses on a practical understanding of equine anatomy and physiology as they relate to management, conditioning, and reproduction. Prereq: VETS 135.

**ANSC 365. Equine Assisted Services Practicum I. 1 Credit.**

In this practicum course, students will complete phase I of their teaching requirements for the Certified Therapeutic Riding Instructor Certification Exam. Prereq: ANSC 265L and ANSC 361.

**ANSC 370. Fundamentals/Animal Disease. 3 Credits.**

Basic principles of disease processes and prevention. Comparative review emphasizing infectious and management related diseases in production and companion species. An emphasis will be placed on public health. Prereq: ANSC 218 or BIOL 220. Recommended prereq: ANSC 114 and MICR 202 or MICR 350.

**ANSC 371. Fundamentals of Animal Disease II. 3 Credits.**

Basic principles of disease processes and prevention. Comparative review emphasizing infectious and management related diseases in domestic animals with a focus on canine, feline and equine species. An emphasis will be placed on public health. Prereq: ANSC 218.

**ANSC 375. Methods of Horsemanship Instruction. 2 Credits.**

In this experiential learning course, students will study methods of instruction, lesson plan development, and demonstrate integration of their knowledge through practical teaching situations, both mounted and unmounted. Prereq: ANSC 361. F (even years).

**ANSC 379. Global Seminar. 1-6 Credits.**

NDSU instructed experience or field study in a foreign country. Conducted in English for residence credit. Pre-requisite: Prior approval by International Student and Study Abroad Services and major department. May be repeated. Standard Grading.

**ANSC 380L. Livestock Sales and Marketing Laboratory. 1 Credit.**

Students will learn the importance of livestock marketing by utilizing livestock selection and evaluation, catalog development, livestock photography, sale advertising, and animal management. Furthermore students will build a customer database, prepare sale advertisements and announcements using various forms of communication such as written and electronic. Students will manage numerous social media platforms. At the end of the semester, students will manage and conduct a livestock auction. Prereq: Junior or Senior standing. Co-req: ANSC 380.

**ANSC 380. Livestock Sales and Marketing. 2 Credits.**

Students will learn the importance of livestock marketing, catalog development, livestock photography, sale advertising, and animal management, and will hold a sale at the end of the semester. Prereq: Junior or Senior standing.

**ANSC 391. Seminar. 1-5 Credits.**

**ANSC 392. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

**ANSC 393. Undergraduate Research. 1-5 Credits.**

**ANSC 394. Individual Study. 1-5 Credits.**

**ANSC 396. Field Experience. 1-15 Credits.**

**ANSC 397. Fe/Coop Ed/Internship. 1-15 Credits.**

**ANSC 399. Special Topics. 1-5 Credits.**

**ANSC 426. Feed Technology. 2 Credits.**

This course is a comprehensive introduction to feed production technology; the science of feeds, feeding, feed additives and feed optimization; and management and legal aspects in providing quality livestock, poultry, aquatic and companion animal feeds. Prereq: ANSC 223 or ANSC 324 or ANSC 360.

**ANSC 440. Hazard Analysis Critical Control Point (HACCP) and Food Safety Systems. 2 Credits.**

Students will become familiar with hazard analysis, critical control point and food safety plans, including good manufacturing practices and standard operating procedures for safe food production. {Also offered for graduate credit - see ANSC 640.}.

**ANSC 444. Livestock Muscle Physiology. 3 Credits.**

Basic concepts in muscle growth and development of livestock, evaluating the effects of environment, welfare, nutrition and genetics regarding muscle metabolism and physiology, and how this ultimately affects the nature of muscle as food. Prereq: BIOC 260. {Also offered for graduate credit - see ANSC 644.}.

**ANSC 457. Genetic Improvement of Livestock. 3 Credits.**

Principles and applications of technologies for the genetic improvement of livestock including both quantitative and molecular techniques. Prereq: ANSC 357.

**ANSC 458. Evaluation and Use of Breeds of Livestock. 3 Credits.**

Evaluation of breeds of cattle, sheep and swine with emphasis of breed comparison research and breed history. Examination of appropriate use of existing breed resources and development of new breeds. Prereq: ANSC 357. {Also offered for graduate credit - see ANSC 658.}.

**ANSC 461. Advanced Horsemanship and Equitation. 1 Credit.**

Advanced emphasis on horsemanship techniques to develop the finished rider. 1 two-hour laboratory. Lab fee. Prereq: ANSC 361.

**ANSC 463. Physiology of Reproduction. 3 Credits.**

Comparative anatomy, physiology, and endocrinology of reproduction in mammals. {Also offered for graduate credit - see ANSC 663.}.

**ANSC 463L. Physiology of Reproduction Laboratory. 1 Credit.**

Anatomy, physiology and demonstration and utilization of techniques in large animal reproductive management. Prereq: ANSC 463. {Also offered for graduate credit - see ANSC 663L.}.

**ANSC 465. Equine Assisted Services Practicum II. 1 Credit.**

In this practicum course, students will complete phase 2 of their teaching requirements for the Certified Therapeutic Riding Instructor Certification Exam. Prereq: ANSC 365.

**ANSC 475. One Health. 2 Credits.**

This course focuses on One Health concepts, emphasizing the interconnectivity between human, animal and environmental health. Prereq: Senior standing. {Also offered for graduate credit - see ANSC 675.}. Cross-listed with PH 475.

**ANSC 478. Research and Issues in Animal Agriculture. 3 Credits.**

Examination of the role of animal agriculture in society, research pertaining to the animal sciences and current issues facing animal agriculture. Prereq: Senior standing with a primary interest in animal agriculture.

**ANSC 480. Equine Industry and Production Systems. 3 Credits.**

A capstone course that incorporates genetics, nutrition, exercise physiology, reproduction, health care, and industry practices into management of the equine enterprise. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 323 or ANSC 360, ANSC 357 or ANSC 358 and ANSC 463.

**ANSC 482. Sheep Industry and Production Systems. 3 Credits.**

A capstone course that incorporates genetics, nutrition, reproduction, disease control, and marketing into sustainable flock enterprises. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 357 and ANSC 463.

**ANSC 484. Swine Production/Pork Industry Systems. 3 Credits.**

Capstone course includes breeding systems, disease control, applied economics, housing, marketing, pork quality, and nutrition in a systems approach. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 357, ANSC 463.

**ANSC 485. Poultry Industry and Production Systems. 3 Credits.**

A capstone course that includes production, management, and marketing of the U.S. poultry industry. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 357, ANSC 463.

**ANSC 486. Beef Industry and Production Systems. 3 Credits.**

Capstone course includes the management, systems, selection, record keeping, merchandising, and production testing of beef. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 357 and ANSC 463.

**ANSC 487. Growing and Finishing Cattle Management. 3 Credits.**

Integrated management of cattle fed for slaughter with emphasis on nutrition, health, marketing, and risk management; covers the beef enterprise from weaning to market. Prereq: Junior or Senior standing. {Also offered for graduate credit - see ANSC 687 .}.

**ANSC 488. Dairy Industry and Production Systems. 3 Credits.**

Capstone course: United States dairy industry including terminology, dairy stock management, economics and finance, facilities, waste management, nutrition, milk quality and animal health. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 463.

**ANSC 491. Seminar. 1-5 Credits.****ANSC 492. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

**ANSC 494. Individual Study. 1-5 Credits.****ANSC 496. Field Experience. 1-15 Credits.****ANSC 499. Special Topics. 1-5 Credits.****ANSC 640. Hazard Analysis Critical Control Point (HACCP) and Food Safety Systems. 2 Credits.**

Students will become familiar with hazard analysis, critical control point and food safety plans, including good manufacturing practices and standard operating procedures for safe food production. {Also offered for undergraduate credit - see ANSC 440.}.

**ANSC 644. Livestock Muscle Physiology. 3 Credits.**

Basic concepts in muscle growth and development of livestock, evaluating the effects of environment, welfare, nutrition and genetics regarding muscle metabolism and physiology, and how this ultimately affects the nature of muscle as food. {Also offered for undergraduate credit - see ANSC 444.}.

**ANSC 657. Genetic Improvement of Livestock. 3 Credits.**

Principles and applications of technologies for the genetic improvement of livestock including both quantitative and molecular techniques. {Also offered for undergraduate credit - see ANSC 457.}.

**ANSC 658. Evaluation and Use of Breeds of Livestock. 3 Credits.**

Evaluation of breeds of cattle, sheep and swine with emphasis of breed comparison research and breed history. Examination of appropriate use of existing breed resources and development of new breeds. {Also offered for undergraduate credit - see ANSC 458.}.

**ANSC 663. Physiology of Reproduction. 3 Credits.**

Comparative anatomy, physiology, and endocrinology of reproduction in mammals. {Also offered for undergraduate credit - see ANSC 463.}.

**ANSC 663L. Physiology of Reproduction Laboratory. 1 Credit.**

Anatomy, physiology and demonstration and utilization of techniques in large animal reproductive management. {Also offered for undergraduate credit - see ANSC 443L.}.

**ANSC 675. One Health. 2 Credits.**

This course focuses on One Health concepts, emphasizing the interconnectivity between human, animal and environmental health. {Also offered for undergraduate credit - see ANSC 475.}. Cross-listed with PH 675.

**ANSC 687. Growing and Finishing Cattle Management. 3 Credits.**

Integrated management of cattle fed for slaughter with emphasis on nutrition, health, marketing, and risk management; covers the beef enterprise from weaning to market. {Also offered for undergraduate credit - see ANSC 487.}.

**ANSC 690. Graduate Seminar. 1-5 Credits.**

**ANSC 695. Field Experience. 1-15 Credits.**

**ANSC 696. Special Topics. 1-5 Credits.**

**ANSC 701. Writing and Communicating in the Animal Sciences. 3 Credits.**

Studying and practicing scientific writing and communication in the animal science discipline.

**ANSC 725. Advanced Equine Nutrition. 3 Credits.**

This course explores concepts in equine nutrition including digestive physiology of horses, nutrient requirements for different classes of horses and feed management. Ration evaluation and balancing, as well as problem solving will be a core component to this course. Prereq: ANSC 776.

**ANSC 740. Data Analyses and Designs of Experiments. 3 Credits.**

Experimental design principles, introductory statistical theory, and commonly used data analyses of animal science data are taught and practiced with practical applications using the computer. 3 lectures. Prereq: STAT 725.

**ANSC 750. Quantitative Genetics Applications of Matrix Algebra. 1 Credit.**

Principles in matrix algebra to describe and solve problems in the agricultural and life sciences, and particularly quantitative genetics. Material includes vocabulary, concepts, and, to a lesser extent, theory of matrix algebra, with application to ecological systems, genotypic transition matrices, selection indices, and the numerator relationship matrix. With matrix algebra, use least squares procedures and canonical transformation to solve problems in biological sciences.

**ANSC 751. A Primer to Quantitative Genetics. 1 Credit.**

Language and foundational principles of quantitative genetics. Material includes basic model for quantitative genetics (additive and non-additive genetic effects, including Mendelian sampling, and environmental effects), sources of variation, heritability, family resemblance and repeatability, selection response, and family selection. Define expected values and concepts in applied statistics. Prereq: ANSC 750.

**ANSC 752. Selection Index Theory and Application. 1 Credit.**

Theory and application of selection indices. Material includes design of animal breeding programs, estimating selection response, constructing economic selection indices, and developing multiple-stage selection strategies. Introduces approaches for deriving economic weights, and predicting economic response to selection. Prereq or Co-req: ANSC 751.

**ANSC 753. Economic Breeding Programs. 1 Credit.**

Principles for developing an economic basis for multiple-trait selection to improve the profitability of production. Material includes review of concepts relevant to the selection index, introduction to the concept of systems analysis, linear programming, and simulation with emphasis on economic values useful for selection index. Critically analyze relevant literature. Prereq or Co-req: ANSC 752.

**ANSC 754. CyberSheep: A Genetic Simulation Game. 1 Credit.**

Principles of genetic selection and mating strategies applied in livestock breeding programs. Through use of a web-based genetic simulation game (CyberSheep), develop skills in implementing a virtual animal breeding program, assess the outcomes of decision-making in terms of genetic response, inbreeding, and economic returns, and experience stochastic elements inherent to livestock systems.

**ANSC 755. Advanced Meat Science. 3 Credits.**

An in-depth investigation of the physical and biochemical characteristics of muscle and meat. Students will gain an understanding of advanced meat science topics, and improve their ability to design, conduct, interpret and report meat science research. (even years).

**ANSC 756. History and Perspectives in Animal Breeding. 1 Credit.**

Historical perspective to the discipline of animal breeding and genetics. Introduction to the contributions of geneticists who have significantly impacted the discipline. Material includes pre-recorded interviews of scientists that have had an international impact in animal breeding and genetics. Critique key papers.

**ANSC 758. Molecular Biological Techniques in Animal Sciences. 3 Credits.**

The theory and application of molecular biology laboratory techniques to the field of animal sciences.

**ANSC 759. Application of Quantitative Genetics in R Software. 1 Credit.**

Introduction and application of R software for basic and intermediate tasks in quantitative genetic analyses. Prereq: ANSC 752 Selection Index Theory and Application, which is offered through the Great Plains IDEA Quantitative Genetics and Genomics program, or equivalent.

**ANSC 773. Energy Metabolism. 3 Credits.**

Methods of measuring energy values and the metabolic processes involved in the production of useful biological energy from organic compounds. 3 lectures. Prereq: BIOC 701. F (odd years).

**ANSC 774. Nitrogen Metabolism. 3 Credits.**

Detailed overview of nitrogenous compounds including metabolism and function. Considerable emphasis on current research from the literature. 3 lectures. Prereq: BIOC 701. S (even years).

**ANSC 776. Digestive Physiology. 3 Credits.**

Investigation of digestive and absorptive events occurring within farm animals. Emphasis on enzyme action, nutrient transport, gut motility, gastrointestinal endocrinology, and current research. 3 lectures. Prereq: BIOC 701. F (odd years).

**ANSC 790. Graduate Seminar. 1-5 Credits.**

**ANSC 791. Temporary/Trial Topics. 1-5 Credits.**

**ANSC 792. Graduate Teaching Experience. 1-6 Credits.**

**ANSC 793. Individual Study/Tutorial. 1-5 Credits.**

**ANSC 795. Field Experience. 1-15 Credits.**

**ANSC 796. Special Topics. 1-5 Credits.**

**ANSC 797. Master's Paper. 1-3 Credits.**

**ANSC 798. Master's Thesis. 1-10 Credits.**

**ANSC 813. Domestic Animal Endocrinology. 3 Credits.**

Detailed overview of the function of hormones and their effects on physiological systems. Considerable emphasis will be placed on experimental approaches, approaches to manipulate endocrine status, and current literature.

**ANSC 828. Advanced Reproductive Biology. 3 Credits.**

Discussion of reproductive physiology research with emphasis on current topics in cellular and molecular biology. 3 lectures. S (odd years).

**ANSC 830. Growth Biology. 3 Credits.**

Regulation of growth at the cell/tissue, organ systems, and whole animal levels. 3 lectures. S (even years).

**ANSC 850. Linear Models in Animal Breeding. 1 Credit.**

Principles of linear models used in animal breeding. Models discussed in the context of the random variable that is to be predicted. Material includes animal models, sire/maternal grandsire models, and sire models, models with a single and repeated records, and models with both direct and maternal effects. Prereq: ANSC 751, ANSC 752.

**ANSC 851. Genetic Prediction. 1 Credit.**

Principles for using best linear unbiased prediction (BLUP) in genetic prediction. Material includes data integrity diagnosis, contemporary grouping strategies, adjusting for known non-genetic effects, the AWK Programming Language, UNIX/Linux scripting, and use of modern computational tools to perform genetic evaluations. Emphasis on real-world datasets designed to develop applied analytical skills in animal breeding. Prereq: ANSC 752, ANSC 850.

**ANSC 852. Applied Variance Component Estimation. 1 Credit.**

Principles in the estimation of (co)variance components and genetic parameters required to solve mixed models typical in livestock genetics. Focus on applied knowledge of approaches used to estimate the G and R sub-matrices of the mixed model equations. Demonstrate models commonly used in parameter estimation. Introduce scientific literature concerning implementation, and attributes of the solutions, of variance component estimation strategies. Prereq; ANSC 850, ANSC 851.

**ANSC 856. Prediction and Control of Inbreeding in Breeding Programs. 1 Credit.**

Principles in the prediction and control of inbreeding in livestock breeding program. Material includes definition of inbreeding and identity by descent, impacts of inbreeding on genotype frequencies, trait means and variances, random drift, computation of inbreeding coefficients in pedigreed populations, prediction of rates of inbreeding in closed populations, and control and management of inbreeding in breeding populations. Prereq: ANSC 751.

**ANSC 875. Vitamins and Minerals. 3 Credits.**

Metabolism of vitamins and minerals and their application in animal nutrition and the feed industry. 3 lectures. Prereq: BIOC 701. F (even years).

**ANSC 892. Graduate Teaching Experience. 1-6 Credits.**

**ANSC 899. Doctoral Dissertation. 1-15 Credits.**