

Course Catalog - Fall 2007

Animal Sciences

100 ***Intro to Animal Sciences*** credit: 4 hours.

Survey of beef and dairy cattle, companion animals, horses, poultry, sheep, and swine. Includes the importance of product technology and the basic principles of nutrition, genetics, physiology, and behavior as they apply to breeding, selection, feeding, and management. Lecture and lab.

103 ***Working With Farm Animals*** credit: 2 hours.

Introductory course that will provide novice students with the fundamentals of animal-animal and animal-human interactions for domestic farm animals. Emphasizes hands-on experiences to develop a background in the concepts and practice of recognizing and understanding the animal's physiology and behavior, animal well being, and animal responses to human interactions. Prerequisite: ANSC 100.

107 ***Agr Cons and Env Systems*** credit: 2 hours.

Same as ACE 107. See ACE 107.

109 ***Meat Pricing and Preparation*** credit: 2 hours.

General approach to meat utilization with emphasis on selecting, grading, cutting, and pricing meat for the home, restaurant, and food service industry; includes laboratory. When appropriate, field trips are taken to area commercial establishments. See Class Schedule approximate cost.

110 ***Life With Animals and Biotech*** credit: 3 hours.

Lecture/discussion course that will provide students an overview of biotechnology and animals. Focuses on biotechnological achievements involving animals and how they influence the global development of agriculture, medicine, and industry. Topics will be covered from scientific, discovery, historical, social, and political perspectives. ***This course satisfies the General Education Criteria for a Life Sciences course.***

119 ***Meat Technology*** credit: 3 hours.

Student participation in the transformation of live animals through harvest and carcass fabrication into food products for human consumption; includes laboratory. Purchase of personal equipment is required; see Class Schedule for approximate cost.

199 ***Undergraduate Open Seminar*** credit: 1 to 5 hours.

An experimental course on a special topic in animal sciences. Topic may not be repeated except in accordance with the Code. May be repeated to a maximum of 12 hours. No more than 12 hours may be counted toward graduation.

201 ***Principles of Dairy Production*** credit: 3 hours.

Surveys the dairy industry; examines principles of breeding, selection, reproduction, feeding, milking and management of dairy cattle. Prerequisite: ANSC 100.

204 ***Intro Dairy Cattle Evaluation*** credit: 2 hours.

Evaluation of physical traits of dairy cattle in relation to economic value and genetic improvement; sire selection, mating systems, and genetic merit for dairy cattle. Field trip required. See Class Schedule for approximate cost of field trip. Prerequisite: ANSC 100 or consent of instructor.

205 ***World Animal Resources*** credit: 3 hours.

Examination of the world's animals, domesticated and wild, and their uses in various climatic, economic and cultural contexts. Exploration of their contemporary management and their future prospects. Provides background for international experiences, such as ACES 298 and ACES 299. Prerequisite: Completion of the campus Composition I general education requirement.

This course satisfies the General Education Criteria for a Advanced Composition course.

206 ***Horse Management*** credit: 3 hours.

Focus on the principles of managing horses from birth through breeding; topics include reproductive physiology, breeding management, nutrition, diseases, parasites, herd health programs, genetics, facility design and exercise physiology. Prerequisite: ANSC 340 and ANSC 331.

207 **Companion Animal Management** credit: 3 hours.

Care and management of companion animals, emphasizing the dog and cat. Subject matter includes such topics as domestication and development of breeds, reproduction and genetics, principles of behavior and training, major infectious diseases, and nutrition and feeding management. Intended for students interested in professional careers with companion animals. Prerequisite: Sophomore standing; ANSC 100 or IB 104 or equivalent.

209 **Meat Animal Carcass Eval** credit: 3 hours.

Study principles and techniques used in meat animal and carcass evaluation along with factors that influence composition, meat quality and preparation. Students planning to enroll in ANSC 310 and ANSC 312 should take ANSC 209 in their sophomore year. Prerequisite: ANSC 100.

211 **Breeding Animal Evaluation** credit: 3 hours.

Application of current scientific tools, methods, and performance programs available to livestock breeders for improving beef cattle, swine, sheep, and horses; emphasis on the changing nature of modern breeds of livestock as influenced by selection, economics, and consumer and market trends. Sophomore standing; credit or concurrent registration in ANSC 209.

213 **Beef and Swine Management** credit: 3 hours.

Examines basic principles of beef cattle and swine management for students other than animal sciences majors. Credit is not given for both ANSC 213 and ANSC 401 or ANSC 403. Prerequisite: ANSC 100.

215 **Humane Edu With Companion Anim** credit: 3 hours.

Course explores humane education as it pertains to companion animals, primarily cats and dogs. The historical aspects of domestication and humane education as well as modern-day relationships between humans and companion animals are addressed. Pet over population and resulting animal shelter issues are discussed in detail. Selection, behavior, and care of companion animals are studied with a focus on promoting the human-companion animal bond, behavioral wellness, and safety. Animal protection laws, animal control laws, and the connection between animal cruelty and violent behavior toward humans are also examined. Prerequisite: Sophomore standing. **This course satisfies the General Education Criteria for a** Advanced Composition course.

293 **Internship Off Campus** credit: 1 to 4 hours.

Supervised, off-campus learning experience in an animal-related enterprise. May be repeated in the same or subsequent terms to a maximum of ten hours. Prerequisite: Good academic standing; ANSC 100.

294 **Intern On Campus Practical Exp** credit: 1 to 5 hours.

Supervised, on-campus learning experience associated with subject matter specific to animal sciences. Approved for both letter and S/U grading. May be repeated in the same or subsequent terms to a maximum of ten hours. Prerequisite: Good academic standing; ANSC 100.

295 **UG Research or Thesis** credit: 1 to 5 hours.

Individual research in animal sciences. May be repeated in the same or subsequent terms to a maximum of ten hours. Prerequisite: Minimum GPA of 2.5; not open to students on probation; consent of instructor.

298 **Undergraduate Seminar** credit: 1 hours.

Presentations and discussion of employment opportunities, departmental research activities, and topics relevant to animal agriculture. Prerequisite: Sophomore standing.

299 **Animal Mgt Field Studies** credit: 1 or 2 hours.

Field studies of farms and service industries; discusses and demonstrates management practices on commercial farms. Trip normally taken during spring break, see Class Schedule for approximate cost.

305 **Human Animal Interactions** credit: 3 hours.

Explores the relationships between humans and companion animals and the roles and functions that animals play in today's society. Examines the evolution of the human/companion animal bond, benefits and disadvantages of this bond, and working/nonworking roles of companion animals. Controversial issues which are of current concern to society will be examined in detail. Writing and in-class discussions are emphasized. Prerequisite: Junior standing.

306 **Equine Science** credit: 3 hours.

Understand and apply current scientific research and principles of equine science to intensive horse production. An in-depth approach to equine reproductive physiology, nutrition, anatomy and exercise physiology will be followed using a combined lecture and laboratory format. Emphasis on current research and hands-on techniques. Prerequisite: ANSC 206, ANSC 331 and ANSC 362, or consent of instructor.

310 **Meat Selection and Grading** credit: 2 hours.

Study characteristics associated with the value of carcasses, primal and retail cuts from meat animals; emphasize USDA grading and specifications as well as written communication. Field trips to meat packing plants are required; see Class Schedule for approximate cost.

312 **Advanced Livestock Evaluation** credit: 3 hours.

Advanced instruction in the selection of breeding animals of beef, sheep, and swine species and in the evaluation of market animals for slaughter. This course requires visits to farms, related companies, and events to observe the latest techniques and scientific principles associated with livestock selection and evaluation. Prerequisite: ANSC 211 or consent of instructor.

313 **Horse Appraisal** credit: 2 hours.

Advanced course for students interested in improving their performance and conformation evaluation skills; provides exposure to the horse show industry and the career opportunities associated with this facet of the horse industry; students may compete in intercollegiate judging contests.

314 **Adv Dairy Cattle Evaluation** credit: 2 hours.

Advanced instruction in the selection of breeding dairy animals. Involves visits to farms, related companies and events to observe the latest techniques and scientific principles associated with dairy cattle selection and evaluation. Field trips for cattle judging are required. May be repeated to a maximum of 4 hours. Prerequisite: ANSC 204 or consent of instructor.

321 **Animal Nutrition** credit: 4 hours.

Principles of animal nutrition and their application to farm livestock and man. Credit is not given for both ANSC 321 and ANSC 325. Prerequisite: CHEM 104 and CHEM 105 or equivalent.

325 **Principles of Animal Nutrition** credit: 3 hours.

Principles of animal nutrition and their application to veterinary practice; designed primarily for students in veterinary medicine. Lecture and laboratory. Credit is not given for both ANSC 325 and ANSC 321. Prerequisite: MCB 350 or equivalent.

331 **Biology of Reproduction** credit: 4 hours.

Study of the basic principles of reproduction, lactation, growth, and hormone regulation of domestic and non-domestic animals as well as humans, including biotechnological methods of reproductive control, manipulation, performance enhancement of lactation and growth, and disease control. Same as IB 331. Prerequisite: Sophomore standing; IB 104 or one introductory level biology course.

This course satisfies the General Education Criteria for a Life Sciences course.

340 **Plant and Animal Genetics** credit: 4 hours.

Same as CPSC 352 and NRES 352. See CPSC 352.

350 **Cellular Metabolism in Animals** credit: 3 hours.

Principles and regulation of cellular metabolism in animals, emphasizing energy derivation and its relationship to domestic animal and food production. Prerequisite: CHEM 104 and CHEM 105 and IB 104.

362 **Princ of Animal Physiology** credit: 4 hours.

A course in animal physiology designed to provide a foundation for advanced courses in the Animal Sciences curriculum. Course emphasizes general principles, structure/function relationships, and underlying physiochemical mechanisms of mammalian physiology. Lectures provide in-depth coverage of the operation, regulation, and integration of major organ systems. Laboratories complement lecture by providing a series of student-conducted in vitro and in vivo experiments designed to illustrate basic physiological concepts and to introduce students to physiology research techniques, instrumentation, experimental design, and interpretation of results. Prerequisite: IB 104, CHEM 102 and CHEM 103, and CHEM 104 and CHEM 105.

363 **Behavior of Domestic Animals** credit: 3 hours.

Introduction to concepts of animal behavior with emphasis on domestic animals; lecture and lab. Same as IB 311. Credit is not given for both ANSC 363 and IB 429. Prerequisite: IB 104 and ANSC 100, or equivalent.

396 **UG Honors Research or Thesis** credit: 1 to 5 hours.

Independent study, under the supervision of a faculty member, on a problem of appropriate scope and character that culminates in writing a thesis. Intended primarily for honors students who plan on conducting research or pursuing graduate study. Thesis projects must be supervised by a faculty member and reviewed by a departmental committee. Students must present a satisfactory thesis to receive credit. May be repeated in the same or subsequent terms to a maximum of ten hours. Prerequisite: Junior standing, minimum GPA of 3.4; consent of a faculty member.

400 **Dairy Herd Management** credit: 3 hours.

The technology of modern milk production practices; application of principles in nutrition, physiology, economics, health and hygiene, waste management, and facilities design for efficient dairy herd management systems. See Class Schedule for approximate cost. Prerequisite: ANSC 321 or equivalent.

401 **Beef Production** credit: 3 hours.

The principles of the management of beef cattle enterprises. Applies science and technology to the breeding, selection, feeding, health and production of beef and beef products. Emphasizes the use of research findings in decision-making. Credit is not given for both ANSC 213 and ANSC 401. Prerequisite: ANSC 321 or equivalent.

402 **Sheep Production** credit: 3 hours.

Study of management, nutrition, reproduction, genetics, marketing, economics, housing, health and production record programs as they apply to sheep production. History of the U. S. sheep industry will be explored along with a study of wool production, marketing and processing. Prerequisite: ANSC 321 or equivalent.

403 **Pork Production** credit: 3 hours.

Applies science and technology to the selection, breeding, feeding, housing and management of swine in a production enterprise; emphasizes use of research findings in decision making. Credit is not given for both ANSC 213 and ANSC 403. Prerequisite: ANSC 340 ANSC 321, and ANSC 467; and ANSC 331 or ANSC 431.

404 **Poultry Science** credit: 3 or 4 hours.

Basic principles of genetics, physiology, nutrition, and health of avian species; the application of science and technology in solving the breeding, nutrition, disease, housing, and other management problems encountered in commercial egg and poultry meat production. Undergraduate and graduate students must complete research project to obtain 4 hours.

405 **Advanced Dairy Management** credit: 2 hours.

Advanced dairy management compliments the four other classes offered in the dairy certificate program featuring applied management principles and practices needed in modern dairy production. Prerequisite: ANSC 201 or equivalent or consent of instructor.

409 **Meat Science** credit: 4 hours.

Fundamental biological principles that influence growth, composition, processing, preservation, and quality of meat and meat products. Prerequisite: CHEM 104 and CHEM 105; MCB 100 and MCB 101, or MCB 300 and MCB 301.

420 **Ruminant Nutrition** credit: 3 hours.

Physiology and microbiology of digestion in the ruminant, and biochemical pathways of utilization of the absorbed nutrients for productive purposes. Prerequisite: ANSC 321.

421 **Minerals and Vitamins** credit: 3 hours.

Nutritional implications and metabolic roles of minerals and vitamins in animal metabolism. The course is designed to instill a basic understanding of vitamin and mineral functions, absorption, metabolism, and excretion. Research methodologies used in the study of vitamin and mineral nutrition will also be discussed. Prerequisite: A nutrition course (ANSC 321, ANSC 325, or equivalent) and credit or concurrent registration in MCB 350 or ANSC 350, or consent of instructor.

422 **Companion Animal Nutrition** credit: 3 hours.

Digestive physiology and basic nutritional considerations of companion animals including canine, feline, laboratory animals, and some wildlife species. Nutritional idiosyncrasies and the importance of nutrition in various physiological states will be emphasized. Current research findings will be used to illustrate development/refinement of nutritional principles applied to these species. Prerequisite: ANSC 321 or equivalent.

423 **Advanced Dairy Nutrition** credit: 2 hours.

All aspects of dairy cattle nutrition will be discussed including nutrients, phase feeding (milk curve analysis, dry matter intake, and body weight loss), dry and transition cow programs, forage feeding systems, feed delivery approaches, metabolic disorders related to nutrition, and application of various dairy feeding guides. Prerequisites: ANSC 201 or equivalent, or consent of instructor.

431 **Advanced Reproductive Biology** credit: 3 hours.

Course is an upper-level undergraduate or entry-level graduate course dealing with reproductive biology. It will include the study of basic cell biology of reproduction, lactation, growth and hormone regulation of domestic and non-domestic animals as well as humans, including biotechnology methods of reproduction control, manipulation, performance enhancement of lactation and growth, and disease control. Prerequisite: ANSC 331 or consent of instructor.

435 **Milk Quality and Udder Health** credit: 2 hours.

An advanced course on the physiological basis of mammary growth, milk secretion, and udder health. Topics covered includes mammary gland anatomy, hormonal control, causes and control of mastitis, milk harvesting, and milk quality. The course will be delivered via CD and web-based synchronous discussion. Students should have a basic course in dairy/animal sciences, or physiology, or consent of the instructor before taking this course. Students may not receive credit for this course and ANSC 438. Prerequisite: ANSC 201 or equivalent or consent of instructor.

437 **Adv Reproductive Management** credit: 2 hours.

The focus of this course is advanced techniques and technologies used to manage production livestock. The course will emphasize advanced and emerging technologies such as embryo transfer, cloning, semen sexing, and ultrasound pregnancy diagnosis and fetal sexing and innovations in existing procedures including artificial insemination, reproductive health management, and estrus synchronization. Implementation of existing and emerging techniques and technologies and research and discovery will be covered for individuals focusing on careers in livestock production, clinical veterinary medicine, education, technical service/support, and research and development. Approved for both letter and S/U grading. Prerequisite: ANSC 331 or equivalent, or consent of instructor.

438 **Lactation Biology** credit: 4 hours.

Examines the structural and functional development of the mammary gland, cell biology, and control of milk synthesis, and composition and biochemistry of milk. Compares and analyzes the physiological processes of lactation in mammals. Prerequisite: ANSC 331.

440 **Applied Statistical Methods I** credit: 4 hours.

Same as ABE 440, CPSC 440, FSHN 440, and NRES 440. See CPSC 440.

441 **Human Genetics** credit: 3 or 4 hours.

Same as ANTH 441. See ANTH 441.

444 **Applied Animal Genetics** credit: 3 hours.

Principles of heredity and their application to the problems of animal improvement. Prerequisite: ANSC 340 or equivalent.

445 **Statistical Methods** credit: 4 hours.

Design and analysis of experiments: multiple regression, method of fitting constants, factorial experiments with unequal subclass numbers, analysis of covariance, experimental design; computer applications to agricultural experiments using statistical packages. Same as ABE 445 and NRES 445. Prerequisite: CPSC 440, or MATH 263, or equivalent.

446 **Population Genetics** credit: 3 or 4 hours.

Mathematical theory of the genetics of populations: estimation of allele frequency for autosomal and X-chromosomal loci, Hardy-Weinberg principle, systems of mating, relationship between relatives, forces that change allele frequency, and quantitative inheritance. Applications to animals, plants, and humans. Same as IB 416. Students desiring 4 hours credit do additional work in some area of population genetics. Prerequisite: ANSC 340; IB 150 or IB 201; one of MATH 220, MATH 221, MATH 234; or consent of instructor.

447 **Quantitative Genetics** credit: 3 or 4 hours.

Mathematical theory of the genetics of quantitative traits: properties of random-mating populations; estimation of repeatability, heritability, and genetic correlation; genetic results of selection; selection methods; correlated response; and selection for more than one trait. Application to animals and plants. Students desiring 4 hours credit do additional work in some area of quantitative genetics. Same as IB 417. Prerequisite: ANSC 446; and credit or concurrent registration in ANSC 445, or CPSC 540; or consent of instructor.

448 **Math Modeling in Life Sciences** credit: 3 or 4 hours.

Introduction to deterministic and stochastic mathematical models for the life sciences, statistical methods for fitting and testing models, and computer simulation programs. Applications to populations, processes, and products of animals, plants, and humans. Same as IB 487 and STAT 458. Students desiring 4 hours credit do additional work in some area of mathematical modeling in the life sciences. Prerequisite: IB 104; a course in calculus, and a course in computer sciences; or consent of instructor.

449 **Biological Modeling** credit: 3 or 4 hours.

Same as CPSC 448, GEOG 468, and IB 491. See GEOG 468.

450 **Comparative Immunobiology** credit: 4 hours.

Advanced concepts of immunophysiology and immunogenetics. Immunophysiology with an emphasis on immune-neuroendocrine interactions. The molecular and cellular basis of self-nonself recognition with an emphasis on the major histocompatibility complex in vertebrates and innate immunity in both vertebrates and invertebrates. The mucosal immune system, which requires a complex interplay between innate and acquired immunity to protect mucosal surfaces exposed to the environment. A working knowledge of genetics and cellular and molecular biology is recommended. Same as MCB 442 and PATH 510.

451 **Microbes and the Anim Indust** credit: 3 hours.

Fundamental aspects of the ecology of microorganisms and their biochemical activities related to the degradation of organic matter with emphasis on the gastrointestinal tract of production animals. Prerequisite: MCB 350 or MCB 352 and MCB 353, and MCB 100 or MCB 300 or MCB 424, or consent of instructor.

452 **Animal Growth and Development** credit: 3 or 4 hours.

Basic principles of animal growth from early fetal development through typical marketing ages for the major domestic animal species. Topics discussed include molecular and cellular determinants of tissue development and whole animal growth, with coverage of current and future technologies for manipulating growth to enhance animal production. 3 or 4 undergraduate hours. 4 graduate hours. Prerequisite: ANSC 362 and ANSC 321; ANSC 350 or MCB 350; or consent of instructor.

455 **Lab Animal Science I** credit: 1 hours.

Same as VCM 646. See VCM 646.

456 **Lab Animal Science II** credit: 1 hours.

Same as VCM 656. See VCM 656.

465 **Ethics in Biotechnology** credit: 3 hours.

Same as CPSC 465 and HORT 465. See HORT 465.

466 **Animal Behavior** credit: 3 hours.

Same as ANTH 442 and IB 429. See IB 429.

467 **Applied Animal Ecology** credit: 3 hours.

An in-depth multidisciplinary approach (physiology, behavior, immunology, neuroscience) to understanding animal-environment interactions (including thermal, air, microbial, photic and behavioral factors) as basis for prescribing practical environments for keeping animals. Courses in physiology, biology, nutrition, microbiology, and genetics are recommended. Prerequisite: ANSC 362.

499 **Seminar** credit: 1 to 4 hours.

Group discussion or an experimental course on a special topic in animal sciences. May be repeated.

509 **Muscle Biology** credit: 2 hours.

Microstructure and chemical composition of muscle tissue; chemistry and biosynthesis of muscle and connective tissue proteins; and biochemical aspects of muscle contraction and rigor mortis. Prerequisite: MCB 350 and BIOC 355.

520 **Protein and Energy Nutrition** credit: 3 hours.

Physiological aspects of protein and amino acids, fats and fatty acids, and carbohydrates as applied to higher animals; includes classification, digestion, absorption, utilization, metabolism, and dietary deficiencies and excesses. Prerequisite: MCB 350 or equivalent and a course in nutrition.

521 **Regulation of Metabolism** credit: 4 hours.

Same as FSHN 511 and NUTR 511. See NUTR 511.

522 **Advanced Ruminant Nutrition** credit: 3 hours.

Physiological and microbiological aspects of ruminant digestion and their influence on the metabolism of the extraruminal tissues; interpretation of nutritive requirements in terms of rumen microbial activities; and evaluation of research techniques. Offered in alternate years. Prerequisite: MCB 350 or equivalent.

523 **Techniques in Animal Nutrition** credit: 3 hours.

Discusses and applies methods of laboratory analysis and animal experimentation frequently used in nutrition research. May be repeated with approval. Prerequisite: Courses in nutrition, physiology, and biochemistry and consent of instructor.

524 **Nonruminant Nutrition Concepts** credit: 2 hours.

Review of literature in nonruminant nutrition. Emphasizes basic concepts associated with food intake, carbohydrate and fat utilization, protein quality, bioavailability of nutrients, and diet formulation. Prerequisite: Consent of instructor.

525 **Topics in Nutrition Research** credit: 1 hours.

Same as FSHN 510 and NUTR 510. See NUTR 510.

530 **Advanced Endocrinology** credit: 2 hours.

Same as MCB 512 and VB 512. See MCB 512.

531 **Adv Reproductive Endocrinology** credit: 3 hours.

The reproductive endocrinology of domestic and laboratory animals. Topics include neuroendocrinology; chemistry, metabolism, and action of hormones, regulation of gonadal function, endocrine changes during puberty, aging, pregnancy, and parturition, external factors affecting reproduction, infertility, and hormones and behavior. Same as MCB 531 and VB 531. Prerequisite: ANSC 431 or MCB 413.

532 **Adv Reproductive Physiology** credit: 3 hours.

Comparative physiology of production of domestic and laboratory animals, including gametogenesis, fertilization, embryonic development, and factors influencing reproduction. Same as VB 532. Prerequisite: ANSC 431 and MCB 350; or equivalent.

533 **Repro Physiology Lab Methods** credit: 1 to 3 hours.

Laboratory methods used in reproductive physiology studies, such as blood sampling, large animal surgery, collection of tissues and gametes, embryo recovery, in vitro fertilization, tissue culture, hormone measurements, and directed individual research problems. Same as MCB 533 and VB 533. Prerequisite: Consent of instructor.

541 **Regression Analysis** credit: 5 hours.

Same as CPSC 541. See CPSC 541.

542 **Applied Bioinformatics** credit: 4 hours.

Introduction to theoretical and applied aspects of bioinformatics. Topics include genomic and proteomic databases, sequence alignment and search algorithms (e.g., BLAST, FASTA, CLUSTAL W), predictive methods in DNA sequence, machine-learning techniques (e.g., Hidden Markov Models) and data mining, biomolecular structure and its prediction, molecular evolution and phylogenetic reconstruction, structural genomics and phylogenomics. Concepts are complemented with hands-on experience with computational biology databases and bioinformatic tools. Same as CPSC 569. Approved for both letter and S/U grading. Prerequisite: Graduate level status or consent of instructor.

543 **Bioinformatics** credit: 4 hours.

Same as CHBE 571, MCB 571, and STAT 530. See CHBE 571.

545 **Statistical Genomics** credit: 3 hours.

This course presents current statistical approaches to analyze DNA microarray, quantitative trait loci and proteomic data and understand the genetic architecture of complex phenotypes including health, performance and behavior. DNA microarray studies measure the expression of thousands of genes simultaneously. Quantitative trait loci (QTL) mapping studies detect associations between genomic regions and phenotypes. Results from these and proteomic studies help identify and quantify genes, regulators and products leading to drug, biotechnology and scientific discoveries. Prerequisite: Graduate level course in Statistics and graduate level course in Molecular Biology.

554 **Immunobiological Methods** credit: 3 hours.

Same as PATH 544. See PATH 544.

561 **Animal Stress Physiology** credit: 2 hours.

Examines animal's physiological and behavioral adaptations to stress. Prerequisite: Consent of the instructor.

590 **Animal Sciences Seminar** credit: 0 to 2 hours.

Discussions of current research and literature. Registration for 0 to 2 hours each term is expected for animal sciences graduate students. Approved for both letter and S/U grading. May be repeated to a maximum of 2 hours for Masters students and 4 hours for Ph.D. students.

592 **Adv Topics in Animal Science** credit: 1 to 4 hours.

Selected topics associated with teaching, research, and production related to the animal industry. Prerequisite: Consent of instructor.

593 **Res Studies in Animal Sciences** credit: 1 to 4 hours.

Directed and supervised study of selected research topics in Animal Sciences. Approved for both letter and S/U grading. May be repeated to a maximum of 4 hours. Prerequisite: Consent of instructor.

599 **Thesis Research** credit: 0 to 16 hours.
Approved for S/U grading only. May be repeated.