

ANIMAL SCIENCE ANS

Department of Animal Science College of Agriculture and Natural Resources

- 101 Professional Development in Animal Science I**
Fall, Spring. 1(0-2) R: Open to students in the Animal Science major.
Careers in animal science. Job application, portfolio development, interviewing, and resume development.
- 110 Introductory Animal Agriculture**
Fall, Spring. 3(3-0) R: Open to undergraduate students or agricultural technology students. SA: ANS 112
History of animal agriculture and its relationship to human needs, production systems, marketing, and environmental considerations. Current goals and limitations affecting U.S. farm animal production.
- 110L Introductory Animal Agriculture Laboratory**
Fall, Spring. 1(0-2)
Hands on experience in working with farm and companion animals. Field trip required.
- 111 Livestock Industries Seminar**
Fall. 1(1-0) R: Open to students in the Institute of Agricultural Technology.
Academic and career planning and professional development in the animal agriculture industry.
- 115 Meats Technology Clerkship**
Fall, Spring. 3(0-6) R: Open to students in the Institute of Agricultural Technology.
Hands-on experience in meat production. Hazard Analysis Critical Control Point (HACCP). Facility maintenance and sanitation. Personnel management.
- 122A Feedlot Clerkship**
Fall. 2(0-4) R: Open to students in the Institute of Agricultural Technology. SA: ANS 024
Clerkship to gain hands-on skills in the management of a working feedlot. Feeding cattle, feed storage, manure management, health programs, evaluation and selection of cattle, facilities maintenance, marketing fed cattle.
- 122B Beef Cow Calf Clerkship**
Spring. 2(0-4) R: Open to students in the Institute of Agricultural Technology. SA: ANS 023
Clerkship to gain hands-on skills in the management of a working cow-calf farm. Feeding, reproduction, genetics, and selection, facilities maintenance, exhibiting cattle for sale and daily management skills.
- 124 Introduction to Sustainable Agriculture and Food Systems**
Fall, Spring. 2(2-0) Interdepartmental with Crop and Soil Sciences and Community Sustainability and Horticulture. Administered by Crop and Soil Sciences. R: Open to undergraduate students or agricultural technology students.
Contemporary research and movements involving agricultural and food system sustainability. Socio-cultural factors influencing food and agriculture.
- 132 Dairy Farm Management Seminar**
Fall. 2(2-0) R: Open to students in the Institute of Agricultural Technology. SA: ANS 054
Challenges and opportunities in the dairy industry.
- 134 Dairy Production I**
Fall. 3(2-2) SA: ANS 232
Introduction to dairy production and the dairy industry.
- 140 Fundamentals of Horsemanship**
Fall, Spring. 2(0-4) A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department.
Safe horse handling skills. Riding skills. Riding aids and working with the horse at the beginner, intermediate or advanced level.
- 140A Fundamentals of Young-Horse Training**
Fall. 2(0-4) RB: ANS 140 R: Open to students in the College of Agriculture and Natural Resources or in the Institute of Agricultural Technology or in the Department of Animal Science or in the Applied Horse Science Major or in the Horse Management Major.
Demonstration and practice of safely working with and training weanlings, yearlings and two-year-old horses. Halter training and longeing techniques of clippers and bathing. Discussion of application of learning theory. Assist with young horse husbandry procedures.
- 141L Draft Horse Basics**
Fall. 2(0-4) SA: ANS 141
Safe handling, hitching and driving of draft horses. Care and maintenance of harness and horse drawn equipment.
- 142 Horse Training for Competition**
Summer. 2(0-4) RB: ANS 140 R: Approval of department.
Training techniques to prepare horses for competition. Exhibiting horses.
- 144 Introduction to Horse Breeding and Foal Management**
Spring. 1(1-0) R: Open to agricultural technology students.
Strategic development for horse breeding based on conformation and genetics, breeding the mare, prenatal and postpartum care.
- 146 Fundamentals of Horse Training**
Fall, Spring. 3(0-6) A student may earn a maximum of 6 credits in all enrollments for this course. P: ANS 140 or approval of department R: Open to undergraduate students in the Institute of Agricultural Technology. Approval of department. SA: ANS 063a
Training and preparing an untrained horse for handling, riding and showing. Sale preparation.
- 147 Horse Management Placement Seminar**
Spring. 1(1-0) R: Open to students in the Institute of Agricultural Technology. SA: ANS 064
Securing a placement training experience. Writing a resume.
- 148 Methods of Instructing Safe Horsemanship**
Spring. 2(2-0) R: Open to students in the Institute of Agricultural Technology. SA: ANS 041
Lesson planning and communication skills for riding instructors. Safety and legal issues. Riding instructor certification. Organizations.
- 149 Horse Management Clerkship**
Spring. 2(0-4) R: Open to students in the Institute of Agricultural Technology. SA: ANS 025
Management of a working horse farm. Feeding, reproduction, genetics, selection, facilities maintenance, and daily management skills.
- 151 Poultry Production Clerkship**
Fall. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
Hands-on experience in poultry production, including nutrition, health, and reproduction. Housing. Records and personnel management.
- 162 Sheep Production Clerkship**
Spring. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
Hands-on experience in sheep production, including nutrition, health, and reproduction. Housing. Records and personnel management. Environmental management.
- 171 Swine Clerkship**
Fall. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
Hands-on experience in swine care. Nutrition. Housing maintenance. Health. Reproduction. Records management. Environmental management. Personnel management.
- 200A Introductory Judging of Livestock or Carcasses**
Spring. 1 to 2 credits. A student may earn a maximum of 3 credits in all enrollments for this course. A student may earn a maximum of 8 credits from ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 200F, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. P: ANS 211 R: Not open to freshmen.
Evaluation of functional conformation of beef cattle, sheep and swine and their carcasses. Preparation for intercollegiate competition. Field trips required.
- 200C Dairy Cattle Genetics and Evaluation**
Spring. 2(2-0) A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. P: ANS 134 SA: ANS 200B
Genetics, breeding and evaluation of functional conformation of dairy cattle. Field trip required.
- 200D Introductory Judging of Horses**
Spring. 1 to 2 credits. A student may earn a maximum of 3 credits in all enrollments for this course. A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 200F, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. SA: ANS 200B
Evaluation of functional conformation and performance of horses. Preparation for intercollegiate competition.

ANS—Animal Science

- 200E Introductory Animal Welfare Assessment**
Fall. 1(0-2) A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 200F, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. RB: (ANS 305 or ZOL 313) and ANS 110
Physiological and behavioral indicators of animal welfare. Quantitative measures and ethical issues. Written and oral assessments of animal welfare.
- 201 Animal Products**
Fall, Spring. 3(3-0) RB: ANS 110 R: Not open to freshmen.
Edible animal products. Food safety. Preservation, storage and distribution of dairy, meat and egg products.
- 201L Animal Products Laboratory**
Fall. 1(0-3) P: ANS 201 or concurrently
Processing and evaluation of meat, milk and egg products.
- 203 Principles of Livestock Feeding**
Spring. 2(2-0) RB: ANS 110 or ANS 222 or ANS 232 or ANS 242 or ANS 272 R: Open to students in the Institute of Agricultural Technology. SA: ANS 059
Feed nutrients, digestion and metabolism. Classification of feeds. Nutrient requirements for dairy and beef cattle, sheep, swine and horses.
- 210 Introduction to Disciplines in Animal Agriculture**
Fall, Spring. 3(3-0) P: ANS 110 or concurrently
Problem solving and literature searches with realistic examples to demonstrate multi-disciplinary scientific solutions in Animal Science.
- 211 Animal and Product Evaluation**
Fall. 3(1-4) P: ANS 110
Evaluation of breeding stock, market animals and carcasses. Performance records and structural correctness of breeding animals. Quality grading, yield grading and pricing of market animals and carcasses.
- 222 Introductory Beef Cattle Management**
Spring. 3(2-2) RB: ANS 110 Not open to students with credit in ANS 422.
Management practices and systems for beef herds. Feed requirements, reproduction, breeding, performance testing, housing, and diseases. Costs and returns.
- 224 Sustainable Farm and Food Systems Field Studies**
Fall. 1(0-4) Interdepartmental with Crop and Soil Sciences and Community Sustainability and Horticulture. Administered by Crop and Soil Sciences. P: CSS 124 R: Not open to freshmen or agricultural technology students.
Field visits to farm and food system operations that utilize sustainable practices in Michigan. Offered first half of semester.
- 225 Horse Behavior and Welfare**
Summer. 2(2-0) R: Open to undergraduate students or agricultural technology students.
Natural behavior, senses, training psychology, and common behavioral problems of horses. Equine welfare issues.
- 233 Dairy Feed Management**
Fall. 3(2-2) P: ANS 134 RB: ANS 203 SA: ANS 051
Feeding management of dairy cattle with emphasis on milking cows and replacements. Cost considerations of nutrient sources and supplies. Use of home-grown feeds. By-product utilization. Field trip required.
- 234 Dairy Production II**
Fall. 3(2-2) P: ANS 134 SA: ANS 215
Introduction to biology and management practices related to growth, lactation, and health of dairy animals.
- 235 Dairy Herd Reproduction**
Spring. 2(2-0) P: ANS 134 RB: ANS 295
Application of reproductive principles to dairy production. Field trip required.
- 235L Dairy Herd Reproduction Laboratory**
Fall, Spring. 2(0-4) P: ANS 235 or concurrently
Reproductive anatomy and physiology, semen handling, artificial insemination in dairy cattle, palpation of female reproductive tract, ultrasound, embryo transfer, and in-vitro fertilization.
- 238 Dairy Cattle Health Management**
Spring. 3(2-2) P: ANS 134
Detection of dairy cattle disease. Infections and metabolic problems.
- 240 Horse Farm Management**
Fall. 3(2-2) RB: ANS 203 and ANS 295 and ANS 242 and ABM 130 R: Open to students in the Institute of Agricultural Technology. SA: ANS 066
Integration of principles and skills into a farm management system. Managerial qualities, goal setting, facilities management. Health programs.
- 242 Introductory Horse Management**
Fall. 3(2-2) Not open to students with credit in ANS 442.
Principles of horse management. Reproduction, nutrition, herd health, genetics, economics, marketing.
- 243 Horse Nutrition and Feeding**
Fall. 2(2-0) P: ANS 203 R: Open to students in the Institute of Agricultural Technology. SA: ANS 078
Nutrient requirements of the horse, selection and evaluation of feedstuffs, balancing diets by hand and by computer, pasture management.
- 244 Horse Facility Design and Management**
Spring. 2(2-0)
Equine facility design and management. Manure, pasture, and biosecurity management.
- 245 Horse Exercise Physiology**
Fall. 2(2-0) RB: ANS 242 R: Open to students in the Institute of Agricultural Technology. SA: ANS 068
Horse body systems, physiology of exercise and conditioning programs. Goals of various conditioning programs. Common ailments of sport horses.
- 247 Horse Health**
Spring. 2(2-0) R: Open to agricultural technology students.
Health risks for horses, emergency care, preventive health care.
- 248 Horse Reproductive Technology and Breeding Techniques**
Spring. 2(2-0) RB: Biology R: Open to agricultural technology students.
Horse reproductive anatomy, physiology, breeding and foaling management.
- 252 Introduction to Management of Avian Species**
Fall of odd years. 3(2-2)
Management of commercial poultry flocks and aviaries. Feed requirements, reproduction, breeding, housing and disease.
- 262 Introductory Sheep Management**
Fall. 3(2-2)
Principles of sheep management: genetics, reproduction, nutrition, marketing, and economics.
- 272 Introductory Swine Management**
Fall. 3(2-2) Not open to students with credit in ANS 472.
Swine production principles, practices, technologies, and systems. Field trip required.
- 282 Companion Animal Biology and Management**
Fall, Spring. 3(3-0)
Principles of companion animal management. Breeds, reproduction, feeding, housing, health, and diseases.
- 290 Independent Study in Agricultural Technology**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to students in the Institute of Agricultural Technology. SA: ANS 057
Independent study in agricultural technology.
- 295 Structure and Function of Livestock**
Spring. 2(3-0) RB: ANS 110 or ANS 222 or ANS 232 or ANS 242 or ANS 272 R: Open to students in the Institute of Agricultural Technology. SA: ANS 205
Gross anatomy of livestock. Functions of tissues and organs. Regulation of growth, lactation, reproduction, seasonality, and temperature.
- 300A Advanced Livestock Judging**
Fall. 2 credits. A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 200F, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. P: ANS 200A R: Not open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition. Field trips required.
- 300C Dairy Cattle Judging Team**
Fall. 2(0-4) A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. P: ANS 200C
Evaluation of conformation of various breeds of dairy cattle. Represent MSU in intercollegiate competition. Field trip required.

- 300D Advanced Horse Judging**
Fall. 2 credits. A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 200F, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. P: ANS 200D R: Not open to freshmen.
Evaluation of functional characteristics of horses. Represent MSU in intercollegiate competition. Field trips required.
- 300E Animal Welfare Judging**
Fall. 2(0-4) A student may earn a maximum of 6 credits in all enrollments for this course. A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 200F, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. P: ANS 200E or concurrently RB: (ANS 110) and (ANS 305 or BIO 313)
Enhanced understanding of the physiological and behavioral indicators of animal welfare. Ethical values in the assessment of welfare status. Intercollegiate competition. Field trips required.
- 300F Dairy Challenge Experiences**
Spring. 2(0-4) A student may earn a maximum of 8 credits from the following courses: ANS 200A, ANS 200C, ANS 200D, ANS 200E, ANS 300A, ANS 300C, ANS 300D, ANS 300E, and ANS 300F. P: ANS 434 or concurrently RB: ANS 434 R: Approval of department.
Evaluation of factors important in successful management of a dairy farm business. Intercollegiate competition as part of Dairy Challenge Team. Field trips required.
- 301 Professional Development in Animal Science II (W)**
Fall, Spring. 3(3-0) P: (ANS 110) and completion of Tier I writing requirement RB: ANS 101 R: Open to juniors or seniors in the Department of Animal Science.
Career preparation in animal science. Job interviewing, oral presentation, and written communication skills.
- 305 Applied Animal Behavior**
Spring, Summer. 3(3-0) P: (ANS 210) and (BS 162 or LB 144 or BS 182H)
Techniques for assessing health and welfare of domestic animals based on their behavior.
- 305L Applied Animal Behavior Laboratory**
Fall. 1(0-2) P: ANS 305
Biological basis of behavior to improve animal health, productivity and welfare.
- 307 Animal Reproduction**
Fall. 3(3-0) P: ANS 210
Reproductive physiology of farm and companion animals. Comparative reproduction in human and laboratory animals.
- 309 Animal Health and Disease Management**
Fall. 3(3-0) P: ANS 110 and (BS 161 or LB 145 or BS 181H)
Normal and abnormal physical parameters. Common diseases. Role of housing, husbandry, sanitation, and animal treatment.
- 313 Principles of Animal Feeding and Nutrition (W)**
Fall. 4(3-2) P: ((BS 161 or LB 145 or BS 181H) and completion of Tier I writing requirement) and ((CEM 143 or concurrently) or (CEM 251 or concurrently))
Comparative nutrition and metabolism for production, health, and stewardship of cattle, horses, swine, poultry, dogs and cats. Diet evaluation and formulation. Feeding management.
- 314 Genetic Improvement of Domestic Animals (W)**
Spring. 4(4-0) P: ((BS 161 or BS 181H or LB 145) and completion of Tier I writing requirement) and (STT 200 or STT 201 or STT 421 or STT 464 or STT 231)
Molecular, Mendelian, population, and quantitative genetics of domestic animals.
- 315 Anatomy and Physiology of Farm Animals**
Spring. 4(3-2) P: BS 161 or LB 145 or BS 181H
Gross and microanatomy of farm animals. Structure directed function of tissues. Endocrine integration for homeostasis. Regulation of growth, lactation, and reproduction. Homeorhesis.
- 334 Dairy Management I**
Fall. 3(2-2) P: ANS 234 RB: ANS 313 SA: ANS 230, ANS 432
Analysis of dairy farm production practices, procedures, and decision-making. Financial analysis of biological and management practices. Field trips required.
- 368 Zoo Animal Biology and Conservation**
Summer. 3(3-0) Interdepartmental with Fisheries and Wildlife and Integrative Biology and Landscape Architecture. Administered by Integrative Biology. P: BS 162 or LB 144 or BS 182H or approval of department RB: Previous work in biology
Captive animal biology including illustrated examples of care, behavioral welfare and conservation work.
- 401 Ethical Issues in Animal Agriculture**
Spring. 1(0-2) RB: ANS 313 or ANS 314 or ANS 315 R: Open to juniors or seniors.
Ethical issues related to local, national, and international animal agriculture.
- 404 Introduction to Quantitative Genetics**
Fall. 3(3-0) P: (ANS 314) and (STT 200 or STT 201 or STT 231 or STT 421 or STT 464)
Theories and applications of quantitative genetics and their roles in breeding.
- 407 Food and Animal Toxicology**
Spring. 3(3-0) P: BS 161 or LB 145 or BS 181H R: Open to juniors or seniors.
Fate and effects of chemicals in the food chain. Impact on animal production. Residues in food products. Food safety assessment. Control methods.
- 409 Problems, Controversies and Advancements in Reproduction (W)**
Fall. 4(4-0) P: (BS 161 or PSL 250) and completion of Tier I writing requirement RB: ANS 307
Selected topics in endocrine, cellular, molecular and genetic aspects of reproduction in humans, livestock and animal models.
- 410 Stem Cells in Reproduction and Development**
Fall of odd years. 3(3-0) P: (BS 161 and BS 171L) and (ANS 307 or approval of department) RB: (BMB 200 or BMB 401) and ANS 425 Not open to students with credit in ANS 810.
Properties and classification of stem cells; methodology to isolate, culture, and differentiate stem cells; mechanisms underlying stemness and differentiation of stem cells; application of stem cells in agricultural studies, veterinary medicine, and biomedical research.
- 413 Non-Ruminant Nutrition**
Fall. 4(3-2) P: (ANS 110 and ANS 313) and (STT 200 or STT 201 or STT 464) RB: BMB 200 or BMB 401 R: Not open to freshmen or sophomores.
Digestive processes and nutrient metabolism in non-ruminant animals. Metabolic basis for nutrient requirements.
- 418 Animal Agriculture and the Environment**
Fall. 3(2-2) Interdepartmental with Biosystems Engineering. Administered by Animal Science. P: (BS 161 or LB 145 or BS 181H) and (CEM 143 or CEM 251) RB: CSS 210
Comprehensive nutrient management plans (CNMP) for animal feeding operations. Trends in animal production, environmental issues, and diet formulation and their impact on manure production. Development of CNMP for a specific animal feeding operation.
- 422 Advanced Beef Cattle Feedlot Management**
Fall. 3(2-2) P: ANS 222 RB: ANS 313 R: Not open to freshmen or sophomores.
Feedlot management systems and issues. Feed systems, manure management, health maintenance, and cattle marketing. Field trips required.
- 424 Sustainable Agriculture and Food Systems: Integration and Synthesis**
Fall. 3(3-0) Interdepartmental with Crop and Soil Sciences and Community Sustainability and Horticulture. Administered by Crop and Soil Sciences. P: CSS 124 and (CSS 224 or concurrently) R: Open to juniors or seniors or graduate students.
Biogeochemical and socio-economic aspects of food, fiber, and fuel production. Environmental impacts and social context. Experiential learning projects.
- 425 Animal Biotechnology**
Spring. 3(3-0) P: (BS 161 or BS 181H or LB 145) and (CEM 143 or CEM 251)
Application of molecular biology concepts to the improvement of domestic animals. Transgenic animal production, molecular genetics and marker assisted selection, animal cloning, Epigenetics, Assisted Reproductive Technologies (ART).
- 427 Environmental Toxicology and Society**
Spring of odd years. 3(3-0) Interdepartmental with Sociology. Administered by Animal Science. RB: ISB 200 or ISB 202 or ISB 204 or BMB 200 or BS 161 or BS 181H or LB 145 or BS 162 or BS 182H or LB 144
Impact of environmental chemicals on health and modern society. Cellular and organ functions and their interface with the environment. Limitations of scientific investigation and environmental regulations.

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- 433 Food Processing: Muscle Foods**
Spring. 3(2-3) Interdepartmental with Food Science. Administered by Food Science. P: (FSC 211) and (FSC 325 or BE 350) R: Not open to freshmen or sophomores. SA: FSC 333
Manufacturing practices and principles of fresh, frozen, and cured meats and fish. Processed products from muscle foods. Product formulation and quality control.
- 434 Dairy Management II**
Spring. 3(2-2) P: ANS 334 SA: ANS 430, ANS 432
Integration, analysis, and problem solving related to dairy production. Field trips required.
- 435 Mammary Physiology (W)**
Spring. 3(3-0) P: ((BS 161 or LB 145 or BS 181H) and completion of Tier I writing requirement) and (ANS 313 and ANS 315) R: Not open to freshmen and not open to sophomores.
Anatomy of the mammary gland and physiology of lactation in domestic and laboratory mammals. Mammary gland health and factors affecting lactation. Dairy herd milking management. Field trips required.
- 442 Advanced Horse Management**
Spring. 3(2-2) P: ANS 242 RB: ANS 313 R: Not open to freshmen or sophomores. SA: ANS 498
Management of stables and breeding farms. Pedigree and conformational selection, reproduction. Promotion, marketing, economics. Nutrition and feeding, facilities, and herd health.
- 445 Equine Exercise Physiology**
Fall. 4(3-2) RB: ANS 313 and ANS 315
Research in equine exercise science. Physical, physiologic, metabolic and mental adaptation to athletic training. Nutrition and bioenergetics of muscle metabolism.
- 455 Avian Physiology**
Spring. 4(3-3) RB: ANS 315 R: Open to juniors or seniors or graduate students.
Systemic and comparative physiology of birds: respiration, reproduction, endocrinology, digestion, urination, and the senses.
- 461 Seminar in Plant, Animal and Microbial Biotechnology**
Spring. 1(1-0) Interdepartmental with Biosystems Engineering and Crop and Soil Sciences and Horticulture. Administered by Horticulture. P: (ANS 425 or concurrently) or (BE 360 or concurrently) or (CSS 451 or concurrently) or (MMG 445 or concurrently)
Current applications of plant, animal and microbial biotechnology in agriculture and related industries. Technologies under development and factors associated with moving from laboratory to product development. Field trips required.
- 464 Statistics for Biologists**
Fall. 3(3-0) Interdepartmental with Crop and Soil Sciences and Statistics and Probability. Administered by Statistics and Probability. P: MTH 103 or MTH 110 or MTH 116 or MTH 132 RB: STT 421
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.
- 472 Advanced Swine Management**
Spring of even years. 3(2-2) P: ANS 272 RB: ANS 313 R: Not open to freshmen or sophomores. SA: ANS 498
Management techniques for operating a swine herd. Management of reproduction and nutrition, records, and general herd health. Integration of husbandry and business principles for decision making.
- 480 Animal Systems in International Development**
Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. R: Not open to freshmen. Approval of department; application required.
Animal systems in various global regions. Output, land and resource conservation, and socio-economic factors.
- 482 Advanced Companion Animal Management**
Spring. 3(2-2) P: ANS 282 and ANS 210 RB: ANS 305 or IBIO 313
Companion animal behavior, welfare, anatomy, physiology, nutrition and health. Careers in the companion animal industry. Experiential learning projects. Field trip required.
- 483 Ruminant Nutrition**
Spring. 3(3-0) P: ANS 313 RB: (ANS 315 or concurrently) and ((BMB 200 or concurrently) or (BMB 401 or concurrently)) R: Not open to freshmen or sophomores.
Nutrition, physiology and metabolism in ruminants. Prehension, digestion, metabolism, absorption, and distribution of nutrients for productive functions. Feeding management strategies and diet formulation. Field trip may be required.
- 490 Independent Study**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. RB: ANS 210 and (ANS 313 and ANS 314 and ANS 315) R: Not open to freshmen. Approval of department; application required.
Independent study in genetics, nutrition, physiology, toxicology, meat science, or management of poultry, livestock, or horses.
- 492 Undergraduate Research in Animal Science**
Fall, Spring, Summer. 3(0-6) A student may earn a maximum of 6 credits in all enrollments for this course. P: (BS 161 or LB 145 or BS 181H) and (CEM 143 or CEM 251) and (ANS 313 or ANS 314 or ANS 315) R: Not open to freshmen or sophomores. Approval of department; application required.
Faculty supervised research in selected areas of animal science.
- 493 Professional Internship in Animal Science**
Fall, Spring, Summer. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, ANR 493, ANS 493, CMP 493, CSS 493, CSUS 493, EEP 493, FIM 493, FOR 493, FSC 493, FW 493, HRT 493, PDC 493, PKG 493, PLP 493 or TSM 493. R: Open to juniors or seniors in the Animal Science Major. Approval of department; application required.
Supervised professional experience in the animal industry.
- 511 Animal Science for Veterinarians**
Fall. 2(2-0) R: Open only to graduate-professional students in the College of Veterinary Medicine.
Husbandry of domestic, laboratory, and zoo animals. Managerial systems in animal agriculture. Production and management goals.
- 801 Methods of Teaching Animal Science**
Fall, Spring. 1(0-2) A student may earn a maximum of 6 credits in all enrollments for this course. RB: One year of graduate coursework and an interest in teaching, outreach, or extension at the college level. R: Open to graduate students in the Department of Animal Science.
Techniques and approaches for developing and teaching animal science courses and assessing student learning.
- 804 Introduction to Quantitative Genetics**
Fall. 3(3-0) RB: (ANS 314) and ((STT 200 or STT 201) or equivalent) Not open to students with credit in ANS 404.
Theories and applications of quantitative genetics. Mutations, recombination, selection, and their roles in shaping genetic variation and covariance in idealized and finite populations.
- 805 Animal Welfare Assessment**
Fall. 3(3-0) Interdepartmental with Integrative Biology. Administered by Animal Science. RB: (ANS 305 or IBIO 313) or background in animal science or zoology including exposure to topics such as animal behavior, physiology, management, and husbandry.
Multidisciplinary online computer-based instruction in animal welfare science and related issues including physiology, behavior, human-animal interactions, suffering and pain, ethics, health, assessment and standards, and economics.
- 810 Stem Cells in Reproduction and Development**
Fall of odd years. 3(3-0) RB: ANS 307 and ANS 425 Not open to students with credit in ANS 410.
Properties and classification of stem cells; methodology to isolate, culture, and differentiate stem cells; mechanisms underlying stemness and differentiation of stem cells; application of stem cells in agricultural studies, veterinary medicine, and biomedical research. Advanced problem solving in agricultural and biomedical research using stem cell technologies. Advanced problem solving in agricultural and biomedical research using stem cell technologies.

- 814 Advanced Statistics for Biologists**
Spring. 4(3-2) Interdepartmental with Crop and Soil Sciences and Statistics and Probability. Administered by Statistics and Probability. RB: STT 464
Concepts of reducing experimental error for biological and agricultural research. Covariance, randomized block designs, latin squares, split plots, repeated-measures designs, regression applications, and response surface designs. Analyses using statistical software.
- 815 Advanced Topics in Reproduction and Development**
Fall, Spring. 3(3-0) RB: Animal Science, Biology and Biomedical Sciences
Core concepts in animal reproduction and development. Recent advances relevant to animal and human fertility, development, and diseases.
- 816 Integrative Toxicology: Mechanisms, Pathology and Regulation**
Fall of odd years. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology and Pathobiology and Diagnostic Investigation and Pharmacology and Toxicology. Administered by Pharmacology and Toxicology.
Biochemical, molecular, and physiological mechanisms of toxicology. Functional and pathological responses of major organ systems to chemical insult. Mechanisms of mutagenesis, carcinogenesis, and reproductive toxicology. Concepts in risk and safety assessment.
- 823 Grant Writing for Biomedical Research**
Spring. 2(2-0) RB: Minimum 2 years completed in a graduate (doctoral) program. R: Approval of department.
Best practices for development, preparation and submission of competitive grant proposals for biomedical research.
- 824 Methods in Quantitative Genomics**
Fall. 3(2-2) RB: ANS 314
Storage, processing and analysis of genotypic and phenotypic data using R. Basic R programming and R tools for genomic analyses. Genome-wide association studies and genomic prediction.
- 828 Scientific Communication for Reproductive and Developmental Biology**
Fall. 1(1-0) RB: Students specializing in reproductive biology. R: Approval of department.
Best practices for preparing and delivering effective scientific seminars in reproductive and developmental biology.
- 849 Applied Bayesian Inference using Monte Carlo Methods for Quantitative Biologists**
Fall of even years. 3(2-2) Interdepartmental with Fisheries and Wildlife and Statistics and Probability. Administered by Fisheries and Wildlife. RB: (STT 814 and IBIO 851) or equivalent courses. R: Not open to undergraduate students.
Applications of Bayesian inference using software in quantitative biology and genetics. Hierarchical and non-hierarchical models. Model checking, model selection and model comparison. Markov chain Monte Carlo methods.
- 870 Mixed Models for Animal Breeding and Genetics**
Fall of even years. 3(3-0) P: STT 814 or approval of department
Best linear unbiased prediction of genetic merit in outbreeding populations using likelihood-based and hierarchical methods.
- 885 Animal Science Seminar**
Spring. 1(1-0) A student may earn a maximum of 2 credits in all enrollments for this course. RB: At least one year of graduate coursework and research experience. R: Open to graduate students in the Department of Animal Science.
Critical review of relevant literature and organization of communication of scientific data in animal science.
- 890 Advanced Independent Study**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Approval of department; application required.
Investigation of topics of special interest.
- 898 Master's Research**
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to master's students in the Department of Animal Science. Approval of department; application required.
Scholarly project for non-thesis (Plan B) master's degree.
- 899 Master's Thesis Research**
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in the Department of Animal Science. Approval of department.
Master's thesis research.
- 901 Selected Topics in Animal Breeding and Genetics**
Fall, Spring, Summer. 1 to 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Selected topics of current interest and importance in animal breeding and genetics.
- 924 Advanced Methods in Quantitative Genomics**
Spring. 3(2-2) RB: ANS 824
Artificial Intelligence applied to genomics, sequence and RNAseq analyses, gene enrichment and functional genomics, population genetics and phylogenetics with applications in livestock.
- 936 Protein Nutrition and Metabolism**
Spring of odd years. 3(3-0) Interdepartmental with Human Nutrition and Foods. Administered by Animal Science.
Nutritional and endocrine regulation of protein synthesis and degradation, protein quality assessment, protein status, and protein-energy malnutrition. Protein metabolism during exercise. Metabolism, digestion, and absorption of amino acids and proteins.
- 999 Doctoral Dissertation Research**
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students in the College of Agriculture and Natural Resources or in the Department of Animal Science. Approval of department.
Doctoral dissertation research.