146 Fundamentals of Horse Training  
Spring. 3(0-6) R: Open to students in the Institute of Agricultural Technology. SA: ANS 063a  
Training and preparing an untrained horse for 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.

171 Swine Clerkship  
Fall. 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.

180A 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 200B, ANS 200C, ANS 200D, ANS 300A, ANS 300B, ANS 300C and ANS 300D. RB: ANS 211  

180C Introductory Judging of Dairy Cattle  
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 200B, ANS 200C, ANS 200D, ANS 300A, ANS 300B, ANS 300C and ANS 300D. SA: ANS 200B  

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 ANS 200A, ANS 200B, ANS 200C, ANS 300A, ANS 300B, ANS 300C and ANS 300D. SA: ANS 200B  
Animal Science—ANS

232 Introductory Dairy Cattle Management
Fall. 3(2-2) Not open to students with credit in ANS 432.
Principles and techniques of dairy herd management including cait and heifer care plus lactating and dry cow management.

233 Dairy Feed Management
Fall. 3(2-2) R: ANS 203 R: Open to students in the Institute of Agricultural Technology. SA: ANS 051

235 Dairy Health Management
Fall. 3(2-2) R: ANS 203 R: Open to students in the Institute of Agricultural Technology. SA: ANS 056
Detection of dairy cattle disease. Infections and metabolic problems.

232 Introductory Dairy Cattle Management
Fall. 3(2-2) Not open to students with credit in ANS 432.
Principles of horse management. Reproduction, nutrition, herd health, genetics, economics, marketing. Field Trips required.

238 Introductory Horse Management
Fall. 3(2-2) R: ANS 203 R: Open to students in the Institute of Agricultural Technology. SA: ANS 242
Independent study in agricultural technology.

235 Dairy Nutrition and Feeding
Fall. 3(2-2) R: ANS 203 R: Open to students in the Institute of Agricultural Technology. SA: ANS 051

240 Horse Farm Management
Fall. 3(2-2) R: ANS 203 and ANS 205 and ANS 242 and ABM 130 R: Open to students in the Horse Management major. SA: ANS 068
Integration of principles and skills into a farm management system. Managerial qualities, goal setting, facilities management. Health programs.

242 Advanced Dairy Cattle Judging
Fall. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

245 Horse Farm Management
Fall. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to students in the Institute of Agricultural Technology. SA: ANS 242
Integration of principles and skills into a farm management system. Managerial qualities, goal setting, facilities management. Health programs.

249 Advanced Swine Production
Fall. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

250 Animal Welfare Judging
Fall. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

251 Advanced Dairy Cattle Judging
Fall. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

252 Introduction to Management of Avian Species
Fall of odd years. 3(2-2)
Management of commercial poultry flocks and avian species. Feed requirements, reproduction, breeding, housing and disease.

254 Animal Welfare Judging
Fall. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

255 Animal Welfare Judging
Fall. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

262 Introductory Sheep Management
Spring. 3(2-2) R: Open only to sophomores or juniors or seniors. Principles of sheep management: genetics, reproduction, nutrition, marketing, and economics. Field Trips required.

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 Trips required.

280 Introduction to Animal International Agriculture
Spring. 3(3-0) R: ANS 110

282 Companion Animal Biology and Management
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.

300A Advanced Livestock Judging
Fall of even years. 2 credits. A student may earn a maximum of 8 credits from ANS 200A, ANS 200B, ANS 200C, ANS 200D, ANS 300A, ANS 300B, ANS 300C and ANS 300D. RB: ANS 200A R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

300B Advanced Dairy Cattle Judging
Fall. 2 credits. A student may earn a maximum of 8 credits from ANS 200A, ANS 200B, ANS 200C, ANS 200D, ANS 300A, ANS 300B, ANS 300C and ANS 300D. RB: ANS 200C R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

300C Advanced Dairy Cattle Judging
Fall. 2 credits. A student may earn a maximum of 8 credits from ANS 200A, ANS 200B, ANS 200C, ANS 200D, ANS 300A, ANS 300B, ANS 300C and ANS 300D. RB: ANS 200C R: Open to freshmen.
Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition.

300D Advanced Horse Judging
Fall. 2 credits. A student may earn a maximum of 8 credits from ANS 200A, ANS 200B, ANS 200C, ANS 200D, ANS 300A, ANS 300B, ANS 300C and ANS 300D. RB: ANS 200D R: Open to freshmen.
Evaluation of functional characteristics of horses. Represent MSU in intercollegiate competition.

300E Animal Welfare Judging
Fall. 1(0-2) A student may earn a maximum of 8 credits in any or all enrollments of ANS 200A, 200B, 200C, 200D, 200E, 300A, 300B, 300C, 300D, or 300E. P: ANS 200E RB: ANS 110 and (ANS 305 or ZOL 313) R: Open to freshmen.
Enhanced understanding of the physiological and behavioral indicators of animal welfare. Ethical values in the assessment of welfare status. Intercollegiate competition. Field trip required.

301 Professional Development in Animal Science II
Fall. 2(1-2) P: (ANS 101 and ANS 110) and completion of Tier I writing requirement R: Open to juniors or seniors in the Department of Animal Science.

305 Applied Animal Behavior
Spring. 3(2-2) P: BS 111
Techniques for assessing health and welfare of domestic animals based on their behavior.

309 Health and Hygiene of Livestock
Fall. 3(3-0) P: ANS 110
Normal and abnormal physical parameters. Common diseases. Role of housing, husbandry, sanitation, and animal treatment in health.

313 Principles of Animal Feeding and Nutrition
Fall. 3(3-2) P: (BS 111) and completion of Tier I writing requirement and ((CEN 143 or concurrently) or (CEM 251 or concurrently)) Principles and practices of nutrition for cattle, horses, poultry, sheep and swine. Metabolism of protein, minerals, and vitamins. Diet formulation. Performance prediction. Nutritional maladies.

314 Genetic Improvement of Domestic Animals
Fall. 3(3-2) P: (BS 111) and completion of Tier I writing requirement and ((MTH 103 or concurrently) or (MTH 116 or concurrently) or (MTH 124 or concurrently) or (LAB 117 or concurrently)) Molecular, Mendelian, population, and quantitative genetics of domestic animals.

315 Anatomy and Physiology of Farm Animals
Spring. 4(3-2) P: (BS 111) and completion of Tier I writing requirement.
Gross and microanatomy of farm animals. Structure and function of tissues. Endocrine integration for homeostasis. Regulation of growth, lactation, and reproduction. HOMEOSTASIS.

390 Animal Science Practicum
Fall, Spring, Summer. 20-6 A student may earn a maximum of 4 credits in all enrollments for this course. P: ANS 110 and (ANS 222 or ANS 232 or ANS 242 or ANS 252 or ANS 262 or ANS 272) RB: Institutional Animal Care and Use Training. Personal health insurance. R: Approval of department. Farm animal production and management. Animal care. Farm management decisions.

401 Ethical Issues in Animal Agriculture
Spring. 3(2-2) 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 Advanced Animal Genetics
Spring of odd years. 2(1-2) P: (ANS 314 or concurrently) or ZOL 341
Application of molecular genetics and genome technologies to animal breeding. Genome maps for agricultural, aquacultural, and companion animal species. Incorporation of genotype data into selection programs.
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: AEB 493, AEH 493, ANR 493, ANS 493, CMP 493, CSS 493, EEP 493, FIM 493, FSC 493, FW 493, HRT 493, PKG 493, PLP 493, PRR 493, and ESA 493. R: Open to juniors or seniors in the Animal Science major. Approval of department; application required. Supervised professional experience in the animal industry.

499 Senior Thesis in Animal Science
Fall, Spring, Summer. 3 to 9 credits. A student may earn a maximum of 9 credits in all enrollments for this course. RB: ANS 313 and ANS 314 and ANS 315 R: Open only to seniors. Approval of department; application required. Maximum of 10 credits may be earned in ANS 499 and ANS 490. Individual studies in an area of choice with both oral and written final communications. Topic to be determined by student and guidance committee.

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.

805 Animal Welfare Assessment
Fall, Spring. 3(3-0) Interdepartmental with Zoology. Administered by Animal Science. RB: (ANS 305 or ZOL 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 Gastrointestinal Microbiology of Domestic Animals
Fall. 3(3-0) Microbial ecology of gastrointestinal tract. Microbial role in nutrition, health, and productivity. Environmental applications. Livestock species emphasized.

814 Advanced Statistics for Biologists

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. P: PHM 819. Biochemical, molecular, and physiological mechanisms of toxicity. Functional and pathological responses of major organ systems to chemical insult. Mechanisms of mutagenesis, carcinogenesis, and reproductive toxicity. Concepts in risk and safety assessment.

824 Methods of Quantitative and Molecular Genetics for Livestock
Spring of odd years. 3(2-2) R: ANS 404. Quantitative and molecular methods for animal geneticists. Identification and evaluation of molecular markers, genome maps, linkage and segregation analyses, optimal mating designs, and marker-quantitative trait loci associations in livestock species.

825 Animal Biotechnology
Spring of even years. 3(3-0) R: Approval of department; application required. Basic concepts in animal biotechnology. Application of molecular biology to animal studies. Current topics in animal biotechnology and use of animals in pharmaceutical development.

827 Integrated Risk Assessment of Environmental Hazards
Spring of odd years. 3(3-0) Interdepartmental with Environmental Engineering. Administered by Animal Science. R: Open only to graduate students in the College of Agriculture and Natural Resources or College of Engineering or College of Human Medicine or College of Natural Science or College of Osteopathic Medicine or College of Veterinary Medicine. Alternative approaches to assessing environmental and health risk. Analyzing, interpreting, and using scientific data from ecology, agriculture, environmental chemodynamics, biology, geological sciences, and toxicology in the risk assessment process.

842 Population Genetics, Genealogy and Genomics
Fall, 3(3-0) Interdepartmental with Crop and Soil Sciences and Forestry and Fisheries and Wildlife and Genetics and Horticulture. Administered by Forestry. RB: Pre-calculus, basic genetics. Population genetic processes underlying patterns of molecular genetic variation. Genealogical approach to the study of genomic diversity, phylogenetic reconstruction, and molecular ecology.

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.

892 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 9 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.

935 Nutrition: Lipid and Carbohydrate Metabolism
Fall of even years. 3(3-0) Interdepartmental with Human Nutrition and Foods. Administered by Human Nutrition and Foods. Regulatory aspects of lipid and carbohydrate metabolism as influenced by nutritional status.

936 Protein Nutrition and Metabolism

937 Mineral and Vitamin Nutrition and Metabolism
Spring of even years. 3(3-0) Interdepartmental with Human Nutrition and Foods. Administered by Animal Science. P: BMB 461 and BMB 462. Forms and locations of mineral elements in the body, metabolic functions, deficiencies, and toxicities, interrelationships and quantitative requirements. Significant vitamins and mineral interrelationships relative to bone metabolism, antioxidant health and erythropoiesis.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in the Department of Animal Science. Approval of department. Doctoral dissertation research.