ANIMAL SCIENCE

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.

110 Introductory Animal Agriculture
Fall, Spring. 4(3-2) R: Open to undergraduates or agricultural technology students.
SA: ANS 112

12A Feedlot Clerkship
Fall. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 024

12B Beef Calf Clerkship
Spring. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 024

12C Dairy Management Seminar
Fall. 1(1-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 054

12D Dairy Farm Management Seminar
Fall. 1(1-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 054

142 Horse Training for Competition
Summer. 2(0-4) R: Open to students in the Animal Science major.

143 Principles of Trail Riding
Summer. 1(1-0) R: Open to students in the Animal Science major.

144 Introduction to Horse Breeding and Foal Management
Spring. 1(1-0) R: Open to students in the Animal Science major.

145 Fundamentals of Horse Training
Fall, Spring. 3(0-6) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 063a

146 Fundamentals of Horsemanship
Spring. 2(2-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 041

147 Horse Management Placement Seminar
Spring. 1(1-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 064

148 Methods of Instructing Safe Horsemanship
Spring. 2(2-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 041

149 Horse Management Clerkship
Fall, Spring. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 024

150 Fundamentals of Horsemanship
Fall, Spring. 2(0-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 141

151 Animal Products
Fall. 3(3-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 141

152 Principles of Livestock Feeding
Spring. 2(2-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 152

153 Principles of Livestock Evaluation
Spring. 2(2-0) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 153

154 Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 154

155 Introductory Judging of Livestock or Carnasses
Spring. 1 to 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course.

156 Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 156

158A Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 158

162 Introductory Judging of Dairy Cattle
Spring. 1 to 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course.

164A Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 164

164B Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 164

164C Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 164

164D Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 164

164E Animal and Product Evaluation
Fall. 3(1-4) R: Open to students in the Institute of Agricultural Technology.
SA: ANS 164
Animal Science—ANS

215 Growth, Health and Lactation in Dairy Cattle

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.

230 Dairy Herd Management

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 calf and heifer care plus lactating and dry cow management.

233 Dairy Feed Management

235 Dairy Herd Reproduction
Spring. 2(2-0) P: ANS 295 RB: ANS 232 or concurrently R: Open to students in the Institute of Agricultural Technology. Application of reproductive principles to dairy production. Field trip required.

238 Dairy Health Management
Spring. 3(2-2) P: ANS 232 or concurrently R: Open to students in the Institute of Agricultural Technology. 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 agri-cultural 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 avian species. Feed requirements, reproduction, breeding, housing and disease.

262 Introductory Sheep Management
Spring. 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

300C Advanced Dairy Cattle Judging

300D Advanced Horse Judging

300E Animal Welfare Judging
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. P: ANS 200E RB: ANS 110 and (ANS 305 or ZOL 313) R: Not 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.

300F Advanced Dairy Farm Evaluation
Spring. 2(0-4) A student may earn a maximum of 6 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 200F and ANS 432) and (ANS 430 or concurrently) RB: ANS 313 R: Not open to freshmen or sophomores. Approval of department. Evaluation of factors important in successful management of a dairy farm business. Represent Michigan State University in intercollegiate competition. Field trips 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. Career preparation in animal science. Job interview skills. Oral presentation, written communication, and critical evaluation of science literature.

305 Applied Animal Behavior
Spring. 3(2-2) P: BS 161 or LB 145 or BS 181H
Techniques for assessing health and welfare of domestic animals based on their behavior.

309 Animal Health and Disease Management
Fall. 3(3-0) P: ANS 110 and (BS 161 or LB 145 or BS 181H)

313 Principles of Animal Feeding and Nutrition
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
Fall, 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) and completion of Tier I writing requirement

401 Ethical Issues in Animal Agriculture
Spring. 10(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.

405 Endocrinology of Reproduction
Fall. 4(3-2) P: ANS 315 R: Not open to freshmen or sophomores.
Endocrine regulation of reproduction. Cellular and molecular aspects of gametogenesis, folliculogenesis, sexual cycles, fertilization, sex differentiation, gestation, and parturition. Technology to regulate reproduction.

407 Food and Animal Toxicology
Fall. 3(3-0) P: BS 161 or LB 145 or BS 181H R: Not open to freshmen or sophomores.

409 Problems, Controversies and Advancements in Reproduction
Fall. 3(3-0) P: BS 161 or PSL 250
Selected topics in endocrine, cellular, molecular and genetic aspects of sex differentiation, gametogenesis, folliculogenesis, sexual cycles, behavior, fertilization, early embryo development, pregnancy, parturition, infertility, reproductive disorders, assisted reproductive technologies in humans, livestock and animal models.

413 Non-Ruminant Nutrition
Spring. 3(3-0) P: ANS 313 RB: BMB 200 or BMB 401 R: Not open to freshmen or sophomores.
Dietary processes and nutrient metabolism in non-ruminant animals. Metabolic basis for nutrient requirements.

414 Advanced Animal Breeding
Spring. 2(2-0) P: ANS 314 R: Not open to freshmen or sophomores.
Application of selection principles and mating systems within and among breeds of livestock. Selection index, expected progeny differences, animal models, crossbreeding systems, multiple ovulation and embryo transfer schemes, multiple trait selection, simulated populations.

415 Growth and Musculoskeletal Biology
Spring. 3(3-0) RB: ANS 315 R: Not open to freshmen or sophomores.

418 Comprehensive Nutrient Management Planning
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(3-2) 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.

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.

430 Dairy Systems Management
Spring. 3(2-3) P: ANS 313 and ANS 432 R: Not open to freshmen or sophomores.
Decision-making strategies for dairy farms. Emphasis on herd replacements, personnel, health, facilities, nutrient management and other issues associated with dynamic markets and business environments. Field trips required.

432 Advanced Dairy Cattle Management
Fall. 3(2-2) P: ANS 232 RB: ANS 313 R: Not open to freshmen or sophomores.
Management techniques for operating a dairy herd. Mastitis control, reproductive and nutrition management, records, and general herd health. Field trips required.

433 Food Processing: Muscle Foods
Fall. 3(2-3) Interdepartmental with Food Science. Administered by Food Science. P: FSC 211 or ANS 201 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.

435 Mammary Physiology
Spring. 4(3-2) P: (BS 161 or LB 145 or BS 181H) and (ANS 313) R: Not open to freshmen and not open to sophomores.

442 Advanced Horse Management
Spring. 3(2-2) P: ANS 242 RB: ANS 313 R: Not open to freshmen or sophomores. SA: ANS 498

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.
Animal Science—ANS

461 Seminar in Animal and Microbial Biotechnology
Spring. 1(1-0) Interdepartmental with Bio-
systems Engineering and Crop and Soil
Sciences and Horticulture. Administered by
Horticulture RH 426 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 asso-
ciated with moving from laboratory to product devel-
opedment. 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 RB:
STT 421
Biological random variables. Estimation of popula-
tion parameters. Testing hypotheses. Linear correla-
tion and regression. Analyses of counted and meas-
ured data to compare several biological groups
including contingency tables and analysis of vari-
ance.

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 enroll-
ments for this course. R: Not open to fresh-
men. Approval of department; application
required.
Animal systems in various global regions. Output,
land and resource conservation, and socio-
economic factors.

483 Ruminant Nutrition
Spring. 3(3-0) P: ANS 313 RB: (ANS 315 or
concurrent) and (BMB 200 or concurrent-
ly) 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 formula-
tion. Field trip may be required.

493 Professional Internship in Animal Science
Fall, Spring, Summer. 3 credits. A student
may earn a maximum of 6 credits in all en-
rollments for this course. A student may
earn a maximum of 6 credits in all enroll-
ments 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 Ma-
or. Approval of department; application re-
quired.
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 Vet-
inary Medicine.
Husbandry of domestic, laboratory, and zoo ani-
mals. Managerial systems in animal agriculture.
Production and management goals.

805 Animal Welfare Assessment
Fall. 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 includ-
ing physiology, behavior, human-animal interactions,
suffering and pain, ethics, health, assessment and
standards, and economics.

814 Advanced Statistics for Biologists
Spring. 4(3-2) Interdepartmental with Crop
and Soil Sciences and Statistics and Proba-
bility. Administered by Statistics and Proba-
bility. RB: STT 464
Concepts of reducing experimental error for biological
and agricultural research. Covariance, random-
ized block designs, Latin squares, split plots, repeat-
ed-measures designs, regression applications, and
response surface designs. Analyses using statisti-
cal software.

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 Toxi-
cology. P: PHM 819
Biochemical, molecular, and physiological mecha-
nisms of toxicity. Functional and pathological
responses of major organ systems to chemical
insult. Mechanisms of mutagenesis, carcinogene-
sis, 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) RB: ANS 404
Quantitative and molecular methods for animal
geneticists. Identification and evaluation of molecu-
lar markers, genome mapping and segregation
analyses, optimal mating designs, and marker-
quantitative trait loci associations in livestock spe-
cies.

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-
es to the study of genomic diversity, phylogenetic
reconstruction, and molecular ecology.

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 ZOL 851)
or equivalent courses. R: Not open to un-
dergraduate 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.

890 Advanced Independent Study
Fall, Spring, Summer. 1 to 4 credits. A stu-
dent may earn a maximum of 6 credits in all
enrollments for this course. R: Approval of
department; application required.
Investigation of topics of special interest.

892 Food Science and Animal Science
Seminar
Fall, Spring. 1(1-0) A student may earn a
maximum of 4 credits in all enrollments for
this course. Interdepartmental with Food
Science. Administered by Food Science. R:
Open to graduate students in the Depart-
ment of Animal Science or in the Depart-
ment of Food Science and Human Nutrition.
Critical review of literature. Organization and com-
munication of scientific data in food science and
animal science.

898 Master's Research
Fall, Spring, Summer. 1 to 6 credits. A stu-
dent may earn a maximum of 10 credits in
all enrollments for this course. R: Open only
to masters 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 stu-
dent may earn a maximum of 99 credits in
all enrollments for this course. R: Open only
to masters 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 stu-
dent 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.
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.