

814. Graduate Student Seminar
Spring. 1 to 3 credits. May reenroll for a maximum of 15 credits. Admittance to Ph.D. program in Department of Anatomy.
Supervised practice in delivering and evaluating written abstracts and public oral presentations of anatomical science; techniques of organization, timing, and effective illustrations. Required annually for all Ph.D. students in anatomy.

815. Anatomy of the Nervous System
Fall. 5(3-5) Approval of department.
Developmental, gross and microscopic anatomy of the nervous system. Organizational and functional aspects of the peripheral and central nervous system are stressed. Gross demonstrations include brain and dog dissections.

820. Advanced Neuroanatomy: Structure and Function of Cells of CNS
Summer. 1 to 5 credits. May reenroll for a maximum of 15 credits. ANT 815 and approval of instructor.
Correlated anatomy and physiology of CNS cells and their processes including current concepts and principles of cytology, ultrastructure, development and plasticity, axonal transport mechanisms, electrical properties and functional connections.

839. Systems Neuroscience
(PSL 839.) Winter of odd-numbered years. 5(4-2) Approval of department. Interdepartmental with the departments of Pharmacology and Toxicology, and Physiology.
Physiology, anatomy and pharmacology of sensory, somatomotor and autonomic neural systems.

865. Advanced Neurobiology
Spring. 4(4-0) ZOL 827. Interdepartmental with the departments of Physiology, Psychology, and Zoology.
Basic organization, structure and function of neural networks comprising sensory, motor, and autonomic systems including examples from invertebrates and vertebrates. Attendance at neuroscience seminar is required.

885. Vertebrate Neural Systems I
(PSY 885.) Winter of odd-numbered years. 5(3-4) ANT 815, ANT 865 recommended. Interdepartmental with the departments of Physiology, Psychology, and Zoology.
Structure and function of major component systems of vertebrate brains, their evolution, ontogeny and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical and physiological studies.

886. Vertebrate Neural Systems II
(ZOL 886.) Spring of odd-numbered years. 5(3-4) ANT 885. Interdepartmental with the departments of Physiology, Psychology, and Zoology.
Continuation of ANT 885. Major component systems of vertebrate brains, their evolution, ontogeny, and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical, and physiological studies.

891. Concepts in Tumorigenesis
Winter of odd-numbered years. 2(2-0) Approval of instructor.
In depth evaluation of the current concepts in tumorigenesis emphasizing the experimental results from which these concepts evolved.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credits. Majors.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Majors.

ANIMAL SCIENCE ANS
College of Agriculture and Natural Resources

111. Animal Industries Colloquium
(213.) Fall. 1(2-0)

History of animal agriculture. Current activities, goals and limitations of animal industries and agribusiness. Professional responsibilities and utilization of academic and non-academic experiences.

211. Principles of Animal Science
Fall, Spring. 5(5-0) B S 211.

Animal industries and species. Principles of genetics, reproduction, lactation, nutrition and management. Systems of production and marketing for farm animals.

217. Evaluation of Animal and Carcass
(A H 235.) Fall. 3(1-4) ANS 211 or concurrently.

Evaluation of breeding stock, market animals, and carcasses. Emphasis on production records and soundness of breeding animals, quality grading, yield grading and pricing market animals and carcasses.

232. Dairy Production Laboratory
Spring. 1(0-3) ANS 211 or concurrently.

Physical characteristics of cows and facilities. Anatomy. Experience in estrous detection, milking equipment, feeds and rations and records. Normal cow behavior.

242. Introduction to Horse Management
(A H 214.) Fall. 3(3-1)

The horse industry in today's society. Relationship of form to function. Selection, breeding, feeding, foot care, health, and management of the pleasure horse.

252. Livestock Production Laboratory
Spring. 1(0-3) ANS 211 or concurrently.

Species and classification of livestock. Anatomy. Feeds and rations. Determining market value. Managerial skills.

256. Meats, Poultry and Fishery Products I
(A H 242.) Fall. 3(2-2) Interdepartmental with and administered by Food Science.

Principles of evaluation and nutritive value. Identification of grades and cuts of beef, pork, lamb and poultry products.

257A. Meat Evaluation and Grading
(A H 245.) Winter. 1(0-3) ANS 217.

Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Evaluation of beef, pork and lamb carcasses and wholesale cuts according to industry and consumer demands. Federal grading standards. Field trips to meat packing operations required.

257B. Meat Evaluation and Grading
(A H 245.) Fall. 1 to 3 credits. ANS 257A. Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Evaluation of beef, pork and lamb carcasses and wholesale cuts according to industry and consumer demands. Federal grading standards. Field trips to meat packing operations required.

261. Introduction to Poultry Production
(P S 224.) Winter, Spring. 3(3-0)

Poultry in the agricultural economy. Fundamental principles of anatomy and physiology. Management practices. Prevention and control of disease.

262. Poultry Production Laboratory
Winter, Spring. 1(0-3) ANS 261 or concurrently or approval of department.

Breeds of poultry. Processing poultry and products. Anatomy and physiology. Facilities, feeds and rations. Evaluation and incubation of eggs. Managerial skills.

312A. Intensive Livestock Systems
Fall. 3(1-4) Juniors, FSM 330 recommended.

Systems study of intensive livestock projects. Enterprise planning and analysis. Feeding and purchasing strategies. Production techniques. Students manage livestock. Field trips required.

312B. Intensive Livestock Systems
Winter. 3(1-4) ANS 312A.

Continuation of ANS 312A. Computer based surveillance and evaluation of livestock project. Marketing concepts and practices. Students manage livestock. Field trips required.

313. Principles of Animal Nutrition
(325.) Fall. 5(5-0) PSL 241, CEM 143; BCH 200 recommended.

Livestock feeds and nutrients. Functions of and requirements for nutrients. Evaluation of feeds. Feeding practices. Formulation of rations for beef and dairy cattle, horses, poultry, sheep and swine.

314. Principles of Animal Breeding
(361.) Winter. 3(3-0) B S 211 or a course in Mendelian genetics.

Quantitative inheritance. Gene frequency. Statistical tools used in animal breeding. Effect of selection and mating systems on animal population.

337. Judging Dairy Cattle
(DRY 323.) Spring. 3(0-6) Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Desired type in dairy cattle. Judging and show ring procedures. Competitive judging. Teams selected to represent Michigan State University in national competition.

347A. Judging Horses
(A H 335.) Spring. 2(0-6) ANS 217. Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Evaluation of conformation. Productive and functional merits of individual horses. Field trips to prominent equine establishments and events required.

**Descriptions — Animal Science
of
Courses**

347B. Judging Horses

(A H 335.) Fall. 1(0-6) ANS 347A. Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Course to be completed in the first half of the quarter. Evaluation of conformation. Productive and functional merits of individual horses. Field trips to prominent equine establishments and events required.

357A. Judging Livestock

(A H 335.) Winter. 1 to 3 credits. ANS 217 or approval of department. Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Evaluation of conformation of cattle, pigs and sheep. Productive and functional merits of individual food animals. Field trips to prominent livestock establishments required.

357B. Judging Livestock

(A H 335.) Spring. 1 to 3 credits. ANS 357A. Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Evaluation of conformation of cattle, pigs and sheep. Productive and functional merits of individual food animals. Field trips to prominent livestock establishments and to major livestock events required.

357C. Judging Livestock

(A H 335.) Fall. 1 to 3 credits. ANS 357B. Students may not earn more than 10 credits from the following courses: ANS 257A, ANS 257B, ANS 337, ANS 347A, ANS 347B, ANS 357A, ANS 357B, ANS 357C.

Evaluation of conformation of cattle, pigs and sheep. Productive and functional merits of individual food animals. Field trips to prominent livestock establishments and to major livestock events required.

400. Independent Study

(A H 415.) Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 10 credits. Approval of department.

Independent study in genetics, nutrition, physiology, toxicology, meat science, or management of poultry or livestock.

413. Toxicology of Food Producing Animals

(450.) Spring. 4(4-0) PSL 240, BCH 200.

Fate and effects of toxic chemicals in food-producing animals: impact on animal production, residues in food products, safety assessment and control methods.

415. Animal Reproduction Laboratory

Winter. 1(0-3) ANS 455 or concurrently.

Reproductive anatomy of mammals and poultry. Estrous detection and synchronization. Artificial insemination, manual examination of reproductive organs and embryo transfer. Evaluation of semen. Reproductive management.

416. Growth Biology of Meat Animals

Spring of even-numbered years. 3(3-0) B S 211, PSL 241, BCH 200.

Fetal and postnatal growth and development in meat animals. Bioenergetic, hormonal, nutritional and metabolic aspects of growth. Criteria for measuring growth of meat animals.

422. Beef Production and Management

(A H 453.) Fall, Spring. 4(3-2) ANS 211, ANS 313 or approval of department.

Feeding, breeding management, marketing. Emphasis on growth and development; costs and returns; feed requirements; reproduction, crossbreeding; performance testing; housing, diseases. Practice in management skills.

432. Dairy Production and Management

(DRY 315.) Spring. 4(3-3) ANS 232, ANS 313, ANS 314, ANS 415, ANS 455.

Management practices and systems for dairy herds. Systems for records, housing, milking, reproduction, nutrition and health. Economic and efficient use of inputs.

433. Ruminant Nutrition

Winter. 4(3-2) ANS 313.

Principles of ruminant nutrition and application to actual feeding practices in commercial dairy and beef operations. Rumen fermentation as related to feed utilization, growth, milk production and milk composition.

434. Dairy Cattle Breeding

(DRY 424.) Spring. 4(2-4) ANS 314.

Applications of population genetics to improving dairy cattle. Use of selection, aids to selection, and systems of mating to formulate breeding plans. Inheritance of economic traits. Breed improvement programs.

435. Mammary Physiology

(DRY 444.) Fall. 4(3-2) PSL 241, BCH 200 or BCH 401. Interdepartmental with the Department of Physiology.

Anatomy of mammary gland. Hormonal and nervous control of mammary growth, initiation and maintenance of lactation. Biochemistry of milk secretion. Physiology of milking; physiological, pathological and management factors affecting lactation.

452. Meat Science Laboratory

(A H 344.) Winter. 2(0-5) ANS 456 or concurrently.

Exercises in meat animal slaughter, meat cutting, wholesale and retail cut identification, processing, inspection, quality control and merchandizing.

454. Meat Animal Breeding

(A H 462.) Spring. 3(2-2) ANS 314.

Uses and effects of different breeding systems with beef cattle, sheep, and swine. Formulating breeding plans.

455. Principles of Animal Reproduction

(DRY 445.) Winter. 4(5-0) PSL 241, BCH 200 or BCH 401. Interdepartmental with the Department of Physiology.

Processes of reproduction and endocrinology with special emphasis on anatomy of reproductive systems, folliculogenesis, gametogenesis, reproductive cycle, fertilization, sex determination, gestation and artificial regulation of these reproductive events for economic benefit.

456. Meat Science and Muscle Biology

(A H 341.) Winter. 4(4-0) BCH 200, PSL 240.

Structure, composition and function of muscle, its conversion to meat, animal growth and fattening. Properties of fresh and processed meat, microbiology, preservation, palatability, inspection and sanitation, by-products, nutritive value.

462. Poultry Production and Management

(P S 435.) Spring of even-numbered years. 5(4-2) ANS 211 or ANS 261 or approval of department.

Practical application of economic and management principles to commercial poultry enterprises. Field trips required.

463. Poultry Nutrition

(P S 413.) Winter of odd-numbered years. 4(3-3) ANS 313.

Factors affecting digestion and utilization of dietary ingredients. Nutrient requirements and formulation of practical poultry feeds. Nutritional problems and assay methods. Food and drug laws influencing poultry feeds.

464. Poultry Breeding and Incubation

(P S 424.) Winter of even-numbered years. 4(3-2) ANS 314.

Genetic and biological factors affecting economic characteristics including egg production, egg size, hatchability, growth and viability and factors involved in the hatching of eggs.

465. Avian Physiology

(P S 440.) Spring. 4(3-3) Approval of department. Interdepartmental with the Department of Physiology.

Systemic physiology of birds emphasizing respiration, circulation, temperature regulation, the endocrines, and reproduction.

469. Avian Diseases and Health

(P S 454.) Winter of even-numbered years. 4(3-2) MPH 200 or B S 212 or approval of department.

Microbiological concepts; causes, preventive and therapeutic methods for poultry diseases, laboratory diagnosis and experiments.

472. Sheep Production and Management

(A H 452.) Winter. 4(3-2) ANS 211, ANS 313 or approval of department.

Management of sheep enterprises. Using the tools of selection, reproduction, nutrition, flock health, housing and marketing to increase returns. Practice in trimming, showing, and management skills.

482. Swine Production and Management

(A H 451.) Fall. 4(3-2) ANS 211, ANS 313 or approval of department.

Historical aspects with emphasis on current trends. Breeds, breeding, selection, nutrition requirements, management practices, marketing, housing and environmental needs, disease and parasite problems. Visits to representative farms.

483. Swine Nutrition

(A H 426.) Spring of odd-numbered years. 3(3-0) ANS 313 or ANS 525; ANS 482.

Digestive and metabolic development and nutrient requirements of swine. Interactions of genetics, disease, endocrinology and environment with nutrition. Critical evaluation of swine feeds and feed formulation. Recent swine nutrition research.

488. Animal Systems in International Development

Winter. 4(4-0) ANS 211 or IDC 200 or PAM 260 or approval of department.

Animal production systems in diverse climatic, geographical and socio-economic environments. Emphasizes species efficiency in human food production and resource use in Africa, Latin America and Asia.

- 525. Animal Nutrition**
Fall, 5(4-2) BCH 401.
Principles of nutrition. Nutrients and their metabolism. Nutritive requirements for maintenance, growth, reproduction, lactation and work. Nutrient sources and their use in preparing diets for domestic animals.
- 800. Advanced Independent Study**
(A H 890.) Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 8 credits. Approval of department.
Investigation of areas within animal science of special interest to graduate students.
- 832. Research Methods in Nutrition**
(A H 827.) Winter of odd-numbered years. 2(2-0) Approval of department.
Experimental techniques in nutrition: ration formulation, animal management, sampling procedures, balance trials, bioassays, tracer methodology, determination of nutrient requirements.
- 871. Design of Animal Experiments**
(854.) Spring, 4(4-0) STT 423.
Choice, implementation and statistical analysis of experimental plans for research with animals. Designs for reduction of experimental error. Analysis of experiments with complex structure or unequal subclass numbers.
- 872. Analysis of Unbalanced Multifactor Data**
(855.) Spring, 4(4-0) STT 423.
Applied analysis techniques of field or survey data in biological sciences with unbalanced subclass numbers. Building models to fit data and research goals. Interpretation of analysis.
- 873. Statistical Packages for Analysis of Experiments**
Fall, 3(2-2) STT 423 or approval of instructor.
Recording data for computer analysis. Computer files and the EDITOR. Methods include SPSS, SAS, BMDP and GENSTAT.
- 899. Master's Thesis Research**
(A H 899.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 931. Advanced Ruminant Nutrition**
(DRY 925.) Fall of even-numbered years. 4(4-0) BCH 452, PSL 801 or approval of department.
Microbiology, physiology and biochemistry of ruminant digestion. Absorption and metabolism of rumen fermentation products.
- 935. Comparative Nutrition—Lipids and Carbohydrates**
(HNF 926.) Winter of odd-numbered years. 4(4-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with and administered by Human Nutrition and Foods.
Regulatory aspects of carbohydrate and lipid metabolism as influenced by nutrition in mammals. Emphasis on normal and abnormal physiological states such as obesity, ketosis and diabetes.

- 936. Comparative Nutrition—Protein Metabolism and Developmental Biology**
(HNF 927.) Winter of even-numbered years. 4(4-0) BCH 453, PSL 801 or approval of department. Interdepartmental with Human Nutrition and Foods.
Protein quality assessment, protein status, protein calorie malnutrition, amino acid metabolism, protein turnover, digestion and absorption, hormonal control of protein metabolism, developmental aspects of protein metabolism and growth.
- 937. Comparative Nutrition—Minerals**
(A H 928.) Spring of even-numbered years. 3 credits. BCH 452, PSL 801. Interdepartmental with Human Nutrition and Foods.
Forms and location in body, metabolic roles, deficiency and toxicity signs, interrelationships, requirements and biological availability of sources.
- 938. Comparative Nutrition—Vitamins**
(A H 929.) Spring of odd-numbered years. 3(3-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with and administered by Human Nutrition and Foods.
Chemical and physical properties, standards of activity, occurrence, metabolic roles, anti-vitamins, deficiency and toxicity signs, requirements and factors affecting requirements.
- 941. Genetics of Breed Improvement**
(A H 963.) Winter of odd-numbered years. 3(3-0) ANS 314, STT 421.
Breed improvement. Changing gene frequency. Genetic and environmental subdivision of phenotypic variance.
- 942. Breeding Systems and Plans**
(A H 964.) Spring of odd-numbered years. 3(3-0) ANS 941.
Biometric relations between related animals. Role of selection in changing populations. The effects of different mating systems.
- 943. Biometrical Genetics**
(965.) Fall, 4(4-0) ANS 872.
Estimation of variance and covariance components. Best linear unbiased prediction of breeding values and selection index. Genetic models for quantitative traits. Correlation of relatives. Selection theory.
- 999. Doctoral Dissertation Research**
(A H 999.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

ANTHROPOLOGY ANP

College of Human Medicine College of Social Science

- 100. Human Evolution**
Fall, Winter, Spring, Summer. 4(4-0)
Scientific fossil and archaeological evidence on human cultural and biological origins; anticipation of culture in other animals; place of humans among the primates; processes of organic evolution; modern human genetic variability; culture as an adaptive mechanism; cultural development to the dawn of civilization.

- 171. Introduction to Sociocultural Anthropology (S)**
Fall, Winter, Spring, Summer. 4(4-0)
Comparison of ways of life among primitive, peasant and civilized peoples. Implications of these styles of life for understanding of human behavior in general and exotic cultures in particular.
- 210. The Anthropological Film**
Winter. 3(2-2)
Ethnographic film as a preserver of vanishing cultures worldwide, as a tool for ethnological analysis and as a creator of perspectives about other cultures and cultural variability.
- 221. Social and Cultural Analysis**
Fall, Spring. 4(4-0) ANP 171 or approval of department.
Basic theoretical framework of socio-cultural analysis: structural functionalism, evolutionism, and cultural ecology.
- 230. Women and Health: Anthropological and International Perspectives**
Winter. 3(3-0)
Crosscultural women's health issues. Health implications of differing life circumstances for women in developing countries. Women as health care providers and consumers. Health issues concerning the female life cycle.
- 250. Culture, Environment and Adaptation (S)**
Fall. 4(4-0)
Culture as an adaptive process—as developed in the million years of human history and still influencing environmental quality, population control, and allocation of resources in primitive and modern societies.
- 255. Prehistory of the Bible Lands**
Spring of odd-numbered years. 3(3-0)
Archaeological evidence for prehistoric cultures of Biblical Palestine up to the establishment of the ancient kingdoms of Judea and Israel around 1200 B.C.; rise of civilization into Old Testament times.
- IDC. Introduction to Contemporary China**
For course description, see Interdisciplinary Courses.
- IDC. Contemporary Japan**
For course description, see Interdisciplinary Courses.
- 262. Status of Women in Culture and Society: A Comparative View**
Fall. 3(3-0)
Comparative analysis of the status of women emphasizing non-Western cultures and societies. Economic and domestic division of labor between the sexes as a factor underlying division of status, power and authority.
- 263. Introduction to Archaeology**
Winter. 3(3-0)
Archaeologists, work in the field and laboratory: dating the past; analysis of finds; interpretation of sites from Stone Age Caves to ceremonial sites.
- 264. Great Discoveries in Archaeology**
Winter. 4(4-0)
Great discoveries in archaeology that have captured the public's imagination and shaped the discipline, from Olduvai Gorge to King Tut's tomb.