

**544. Human Ontogenesis**

Fall. 3(3-0) Admission to a college of medicine; graduate students with approval of department.

Formal lectures, class conferences and student reports on the normal and abnormal organogenesis of the human embryo and fetus with emphasis on clinical correlations.

**545. Neuroanatomy**

Winter. 3(4-0) Admission to medical school or approval of Neuroscience Committee.

Introduction to gross and microscopic anatomy of the human nervous system, to related basic neurophysiologic concepts and to a problem-solving approach to the diagnosis of nervous system disease.

**560. Medical Histology**

Fall. 4(3-4) Admission to a college of medicine or approval of department.

Structural and functional characteristics of basic cells, tissues and organ systems. Emphasis on core concepts and visual discrimination.

**563. Osteopathic Medical Neuroanatomy**

Spring. 4(3-4) Admission to a college of medicine; graduate students with approval of department.

Medically oriented problem-solving neuroanatomy with laboratory. Structure of the human nervous system is correlated with normal function, clinical testing and classical lesions encountered in medical practice.

**565. Introduction to Human Gross Anatomy**

Fall. 6(4-6) Admission to a college of medicine or approval of department.

Core concepts in regional, systemic and topographical human gross anatomy; Prosection, discussion and lecture methods using audiovisual aids and frequent review.

**580. Special Problems**

Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 15 credits. Admission to professional program in the College of Human Medicine, College of Osteopathic Medicine or the College of Veterinary Medicine, and approval of department.

Biomedical research, gross anatomy, histology, neurology, immunology or embryology.

**813. Problems in Anatomy**

Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 15 credits. Basic disciplines in various areas and approval of department.

Various anatomical fields such as gross anatomy, histology, hematology, tissue culture, cytology, neurology and embryology will be studied.

**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**

Spring. 3 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.

**865. Advanced Neurobiology**

Spring. 4(4-0) BPY 827. Interdepartmental with Biophysics and 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 even-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 even-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 even-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 HUSBANDRY**

See Animal Science.

**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**

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.

## Descriptions – Animal Science

of

### Courses

#### 313. Principles of Animal Nutrition

(325.) Spring. 5(5-0) PSL 241, CEM 132; 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) BS 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 showing 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.

#### 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) BS 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 244., 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 241., 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.) Fall. 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 BS 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.
- 854. Design of Animal Experiments**  
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.
- 855. Analysis of Unbalanced Multifactor Data**  
Spring. 4(4-0) STT 423.  
Applied analysis techniques of field or survey data with unbalanced subclass numbers in field of biological sciences: predictions utilizing several variables; estimation of effects of factors and their interactions.
- 965. Biometrical Genetics**  
Fall of odd-numbered years. 4(4-0) ANS 855 and one course in quantitative genetics.  
Genetics models for quantitative traits: estimation of components of variance; correlation of relatives; Selection Index theory; multi-factor and multivariate responses in designed experiments.
- Animal Husbandry A H**
- 827. Research Methods in Nutrition**  
Fall. 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.
- 890. Advanced Special Problems**  
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 8 credits. Approval of department.  
Investigation of animal husbandry areas of special interest to individual graduate students.
- 899. Master's Thesis Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 926. Comparative Nutrition-Lipids and Carbohydrates**  
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.
- 927. Comparative Nutrition-Protein Metabolism and Developmental Biology**  
Winter of even-numbered years. 4(4-0) BCH 452, PSL 802 or concurrently. Interdepartmental with and administered by 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.
- 928. Comparative Nutrition-Minerals**  
Spring of even-numbered years. 3 credits. BCH 452, PSL 802. Interdepartmental with Human Nutrition and Foods.  
Forms and location in body, metabolic roles, deficiency and toxicity signs, interrelationships, requirements and biological availability of sources.
- 929. Comparative Nutrition-Vitamins**  
Spring of odd-numbered years. 3(3-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with Human Nutrition and Foods.  
Chemical and physical properties, standards of activity, occurrence, metabolic roles, antivitamins, deficiency and toxicity signs, requirements and factors affecting requirements.
- 963. Genetics of Breed Improvement**  
Winter of odd-numbered years. 3(3-0) ANS 361, STT 421.  
Breed improvement. Changing gene frequency. Genetic and environmental subdivision of phenotypic variance.
- 964. Breeding Systems and Plans**  
Spring of odd-numbered years. 3(3-0) A H 963.  
Biometric relations between related animals. Role of selection in changing populations. The effects of different mating systems.
- 999. Doctoral Dissertation Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- Dairy Science DRY**
- 899. Master's Thesis Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 925. Advanced Ruminant Nutrition**  
Fall of even-numbered years. 4(4-0) BCH 452, PSL 801 or approval of department.  
Microbiology, physiology and biochemistry of ruminant digestion and the absorption and metabolism of rumen fermentation products.
- 945. Physiology of Mammalian Reproduction**  
Winter of odd-numbered years. 4(5-0) DRY 445 or PSL 445 or approval of department. Interdepartmental with the Department of Physiology.  
Chemistry and biosynthesis of reproductive hormones. Gonadal, hypothalamic and pituitary development of reproductive potential. Ovulation, fertilization, implantation and placentation will be studied. Relationships of conceptus, uterus and corpus luteum. Parturition.
- 999. Doctoral Dissertation Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- Poultry Science P S**
- 899. Master's Thesis Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 999. Doctoral Dissertation Research**  
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.
- 221. Introduction to Social and Cultural Analysis**  
Fall, Spring. 4(4-0)  
Basic theoretical framework of socio-cultural analysis: structural functionalism, evolutionism, and cultural ecology.
- 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.