

- 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

### College of Agriculture and Natural Resources

#### Animal Husbandry A H

- 111. Livestock and Meat Industry**  
Fall, Spring. 4(3-4)  
Livestock utilization of renewable resources in producing products for man. Adaptation, economics of production and management systems of beef cattle, swine, sheep and horse enterprises. Evaluation of market livestock.

- 214. Introduction to Horses and Horsemanship**  
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. Proper horsemanship methods.

- 235. Live Animal and Carcass Evaluation and Selection**  
Fall. 3(1-4) A H 111 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.

- 242. Meats, Poultry and Fishery Products I**  
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.

- 245. Meat Evaluation and Grading**  
Fall, Winter. 1 to 3 credits. May reenroll for a maximum of 4 credits subject to a maximum of 10 credits in A H 245 and A H 335 combined. A H 235.  
Evaluation of beef, pork, and lamb carcasses and wholesale cuts according to industry and consumer demands and federal grading regulations. Numerous field trips to meat packing operations.

- 335. Livestock Selection**  
Fall, Winter, Spring. 1 to 3 credits. May reenroll for a maximum of 9 credits subject to a maximum of 10 credits in A H 245 and A H 335 combined. A H 235.

Evaluation of productive merit of individual animals. Comparison of type with a standard. Relationship of form to function. Field trips to prominent livestock breeding establishments and to major livestock events.

- 341. Principles of Meat Science**  
(241.) Winter. 3(3-0) 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.

- 344. Meat Science Laboratory**  
(244.) Winter. 2(0-5) A H 341 or concurrently.  
Exercises in meat animal slaughter, meat cutting, wholesale and retail cut identification, processing, inspection, quality control and merchandizing.

- 415. Special Problems**  
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 8 credits. Approval of department.  
Special problems in: animal breeding, ruminant nutrition, nonruminant nutrition, management, meat science, or reproduction.

- 426. Swine Nutrition**  
Spring of odd-numbered years. 3(3-0) A H 451; ANS 325 or ANS 525.  
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.

- 451. Swine Production**  
Fall. 4(3-2) ANS 325 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.

- 452. Sheep Production**  
Winter. 4(3-2) ANS 325 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.

- 453. Beef Production**  
Fall, Spring. 4(3-2) ANS 325 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.

- 462. Meat Animal Breeding**  
Spring. 3(2-2) ANS 361.  
Uses and effects of different breeding systems with beef cattle, sheep, and swine. Formulating breeding plans.

- 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.

- 912. Seminar**  
Fall, Winter, Spring. 1 credit.

- 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, antivitamin deficiencies 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.

## Descriptions – Animal Science

### of Courses

999. **Doctoral Dissertation Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

### Dairy Science

DRY

1005. **Dairy Career Alternatives**

Fall. 1(1-0) Credits earned in this course are included in computation of GPA and MAPS but are not included in the 180 credits required for graduation.

Career and employment options for dairy majors including research, education, farming, agribusiness, government, and financial, including self-instructional unit on career planning.

214. **Dairy Production**

Fall, Spring. 4(3-2)

Dairy cattle in modern agriculture. Normal cow behavior. Feeding, breeding and management of herd. Commercial milk production and marketing milk.

250. **Dairy Physiology and Management**

Fall. 4(3-2) B S 210 or B S 211; DRY 1005 or approval of department.

Basic reproductive and lactational physiology; management practices for maximum reproductive performance and maximum production of high quality milk.

314. **Dairy Herdsman Techniques**

Winter. 2(0-4) DRY 214, majors only.

Herd health and management procedures, disease prevention and detection, equipment maintenance and record systems for dairy herds.

315. **Dairy Herd Management**

Spring. 4(4-0) DRY 250.

Dairy herd management practices, dairy records systems, housing, milking, reproduction and feeding systems. Economic and efficient usage of inputs.

323. **Dairy Cattle Judging**

Spring. 3(0-6)

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

371. **Seminar**

Spring. 1(1-0) Juniors.

Major issues pertinent to the dairy industry are described by authorities from MSU and the dairy industry of Michigan. Students are provided an opportunity for an exchange in ideas.

424. **Dairy Cattle Breeding**

Spring. 4(2-4) ANS 361.

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.

433. **Ruminant Nutrition**

Winter. 4(3-2) ANS 325. Interdepartmental with Animal Science.

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.

444. **Mammary Physiology**

Winter. 4(3-2) PSL 240, BCH 200. Interdepartmental and administered jointly 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.

445. **Endocrinology and Reproductive Physiology**

Fall. 4(5-0) PSL 240. Interdepartmental and administered jointly 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.

450. **Toxicology of Food Producing Animals**

Spring. 4(4-0) PSL 240, BCH 200. Interdepartmental with and administered by Animal Science.

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

460. **Special Problems**

Fall, Winter, Spring, Summer. Variable credit. May reenroll for a maximum of 10 credits. Approval of department.

850. **Topics in Dairy Science**

Fall, Winter, Spring. Variable credit. May reenroll for credit. Approval of department.

Topics from breeding, management, nutrition, or physiology, changing from term to term to include recent technical advances.

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

224. **Poultry Science and Practice**

Winter, Spring. 4(3-2)

Poultry in the agricultural economy; fundamental principles of anatomy, physiology and body systems; diseases, their prevention and control; management practices and procedures in producing poultry meat and eggs.

301. **Special Problems**

Fall, Winter, Spring, Summer. Variable credit. May reenroll for a maximum of 6 credits. Approval of department.

Studies in any of the following: avian genetics, management, nutrition, physiology, other areas of poultry science.

413. **Avian Nutrition**

Fall. 4(3-3) ANS 325.

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.

424. **Poultry Breeding and Incubation**

Winter of even-numbered years. 4(3-2) ANS 361.

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

435. **Poultry Industry--Management and Marketing**

Spring of even-numbered years. 5(4-2) P S 224 or approval of department.

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

440. **Avian Physiology**

Spring. 4(3-3) Approval of department. Interdepartmental and administered jointly with the Department of Physiology.

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

454. **Avian Disease Prevention and Treatment**

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.

800. **Advanced Poultry--Special Problems**

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Studies in any of the following: avian genetics, management, nutrition, physiology, other areas of poultry science.

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.

**ANIMAL SCIENCE                      ANS****College of Agriculture and Natural Resources****101. Animal Science**  
*Fall. 5(4-2)*

Survey of the animal industries including history, economic geography, anatomy and physiology, nutrition and feed usage, and systems of commercial livestock and poultry production.

**213. Animal Science Seminar**  
*Fall. 1(2-0)*

Animal science industries. Industry representatives will be utilized to discuss particular areas.

**325. Principles of Animal Nutrition**  
*Spring. 5(5-0) CEM 132; BCH 200 recommended.*

Livestock feeds and their 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.

**361. Principles of Animal Breeding**  
*(461.) 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.

**433. Ruminant Nutrition**  
*Winter. 4(3-2) ANS 325. Interdepartmental with and administered by Dairy Science.*

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.

**450. Toxicology of Food Producing Animals**  
*Spring. 4(4-0) PSL 240, BCH 200. Interdepartmental with Dairy Science.*

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

**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.

**826. Animal Nutrition**  
*Spring. 4(4-0) One course each: biochemistry, physiology; and approval of department.*

Nutrition basic to animal feeding. Application of chemistry and physiology to nutrition. Nutrient requirements for normal body functions. Techniques involved in nutrition research; readings in current literature.

**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.

**ANTHROPOLOGY                      ANP****College of Human Medicine  
College of Osteopathic Medicine  
College of Social Science****100. The Origin of Man and Culture**  
*Fall, Winter, Spring, Summer. 4(3-1)*

Introduction to physical anthropology; the position of man in the animal kingdom, the genetic mechanisms of evolution, human beginnings and the fossil record, racial evolution and racial types among modern man, the anticipation of culture among other animals and the development of human culture, and culture as an adaptive mechanism.

**171. Introduction to Sociocultural Anthropology (S)**  
*Fall, Winter, Spring, Summer. 4(3-1)*

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.

**IDC. Introduction to Latin America I**  
*For course description, see Interdisciplinary Courses.***221. Introduction to Social and Cultural Analysis**  
*Fall, Spring. 4(3-1) ANP 171.*

Basic theoretical framework of socio-cultural analysis: structural functionalism, evolutionism, and cultural ecology.

**250. Culture, Environment and Adaptation (S)**  
*Fall. 4(3-1)*

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.

**IDC. Introduction to Contemporary China**  
*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. Origin of Civilization: Archaeology**  
*Winter. 4(4-0)*

The rise, development and spread of culture in the period before written history. Archaeological evidence is used to trace the evolution of culture as it has been reconstructed from the excavation of prehistoric sites in the Old and New World.

**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.

**265. Vanished Peoples and Lost Civilizations**  
*Fall, Spring. 4(4-0)*

Concepts of cultural evolution and origins of civilization as found in popular literature ranging from Atlantis to Chariots of the Gods.

**266. War and Aggression**  
*Fall, Spring. 3(3-0)*

The question 'What makes friends and what makes enemies?' is examined from the standpoint of cultural anthropology. Violence-prone cultures and peaceful ones are compared for factors influencing human aggression.

**275. The Anthropology of Asia**  
*Fall. 4(4-0)*

Several cultural complexes and culture types—from hunting and gathering through complex civilization—of East, Southeast, and South Asia. The cultures and nature of their development will be examined. Past and present significance of cultural stability and change will be seen in a comparative framework.

**281. The Africans and Their Cultures**  
*Spring. 4(4-0)*

Racial and cultural problems confronting the African peoples.

**285. Anthropological Perspectives on Global Interdependence**  
*Spring. 4(2-2) ANP 171.*

Interwoven nature of cultural traditions in the modern world. Consideration of how people of developing nations respond to the dominant cultural forces of industrialized nations.

**IDC. Contemporary South Asia**  
*For course description, see Interdisciplinary Courses.***343. Introduction to Physical Anthropology**  
*Fall. 4(3-2)*

Problems, data and techniques associated with the main topical areas of physical anthropology: human genetics, hominid evolution, primate behavior, human osteology and human diversity. Field trips may be required.