540. Gross Biomedical Structure
Winter. 1 to 15 credits. May re-enroll for a maximum of 15 credits. Admission to a college of medicine; graduate students with approval of department. Regional gross anatomy of the head, thorax, abdomen, pelvis and perineum.

541. Gross Biomedical Structure
Spring. 1 to 15 credits. Admission to a college of medicine; graduate students with approval of department. Regional gross anatomy of the head and neck.

542. Gross Biomedical Structure
Fall. 1 to 15 credits. Admission to a college of medicine; graduate students with approval of department. Regional gross anatomy of the limbs.

543. Microscopic Anatomy
Winter. 3(3-0). Human Medicine students; approval of department for graduate students. The principles of microscopic anatomy, utilizing self-instructional units and laboratory experience with organ sections viewed through the light microscope.

544. Human Embryology
Winter. 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 organization of the human embryo and fetus with emphasis on clinical correlations.

545. Neuroanatomy
Spring. 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.

546. Medical Histology
Summer. 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.

547. Osteopathic Medical Neuroanatomy
Fall. 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.

548. Introduction to Human Gross Anatomy
Semester. 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.

549. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 15 credits. Admission to professional programs 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. 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.

816. Developmental Anatomy
Fall. 4(3-5) Graduate students or approval of department. Study of the normal and abnormal organization of the human embryo and fetus.

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. Research
Fall, Winter, Spring, Summer. Variable credit. Majors.

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

584. Animal Husbandry—Descriptions of Courses

841. Principles of Meat Science
Winter. 3(3-0) Sophomores. Structure, composition and function of muscle, its conversion to meat, animal growth and fattening, properties of fresh and processed meat, microbiology, preservability, palatability, inspection and sanitation, by-products, nutritive value.

842. Meats, Poultry and Fishery Products
Fall. 3(4-3) 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.

844. Meat Science Laboratory
Fall, Spring. 2(0-5) Sophomores; 241 or concurrently. Principles of meat animal and carcass evaluation, slaughter, meat cutting, retail cut identification, processing, inspection and quality control.

845. Meat Evaluation and Grading
Fall, Spring. 1 to 3 credits. May re-enroll for a maximum of 10 credits subject to a maximum of 10 credits in 245 and 335 combined. Evaluation of carcasses and wholesale cuts of beef, pork, veal and lamb in accordance with federal and commercial grading standards. Inspection trips through large meat packing plants.

335. Livestock Selection
Fall. Winter, Spring. 1 to 3 credits. May re-enroll for a maximum of 9 credits subject to a maximum of 10 credits in 245 and 335 combined. 111. 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.

415. Special Problems
Fall, Winter, Spring. Summer. 1 to 3 credits. May re-enroll for a maximum of 5 credits. Approval of department. Special problems in: animal breeding, nutrition, nutriment, nutrition, management, meat science, or reproduction.

426. Swine Nutrition
Spring of odd-numbered years. 3(3-0)
451: ANS 325 or 325. 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(3-3) 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 parasites problems. Visits to representative farms.

452. Sheep Production
Winter. 4(3-3) 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
Spring. 4(3-3) ANS 325 or approval of department.
Feeding, breeding management, marketing. Emphasis on research and development; costs and returns; feed requirements; reproduction, cross-breeding; performance testing; housing; diseases. Practice in management skills. One field trip.

462. Meat Animal Breeding
Spring. 2(2-0) ANS 461.
Uses and effects of different breeding systems with beef cattle, sheep, and swine. Formulating breeding plans.

IDC. The Impact of Animal Resource Management Upon the World's Developing Nations
For course description, see Interdisciplinary Courses.

825. Techniques in Nutrition Research
Winter of odd-numbered years. 1 to 3 credits. CEM 333; approval of department. Interdepartmental with Human Nutrition and Foods.
Use of specialized instruments and techniques. Laboratory safety. Management of laboratory animals. Development of abilities in areas of particular interest to individual students.

890. Advanced Special Problems
Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 8 credits. Approval of department.
Investigation of animal husbandry areas of special interest to individual graduate students.

899. 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 nutrition. Interdepartmental with and administered by Human Nutrition and Foods.
Use of specialized instruments and techniques. Laboratory safety. Management of laboratory animals. Development of abilities in areas of particular interest to individual students.

927. Comparative Nutrition-Protein Metabolism and Developmental Biology
Winter of even-numbered years. 4(4-0) BCH 452, FSL 902 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 453, FSL 902. 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. 3(3-0) ANS 481, STT 431.

964. Breeding Systems and Plans
Spring. 3(3-0) 963.
Biometric relations between related animals. Role of selection in changing populations. The effects of different mating systems.

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

ANIMAL SCIENCE

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(0-0)
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.

433. Ruminant Nutrition
(DRY 433.) Winter. 4(3-2) 325. Interdepartmental with and administered by the Department of 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.

461. Principles of Animal Breeding
Winter. 3(3-0) CSS 250.

525. Animal Nutrition
Winter, 5(4-2) BCH 401.

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.

895. Biometrical Genetics
Fall of odd-numbered years. 4(4-0) 853 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

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
Fall, Winter, Spring, Summer. 4(3-1)
Comparison of ways of life among primitive, pastoral, and civilized peoples. Implications of these styles of life for understanding of human behavior in general and exotic cultures in particular.

IDC. Resource Ecology and Man
For course description, see Interdisciplinary Courses.

IDC. Introduction to Latin America I
For course description, see Interdisciplinary Courses.

221. Introduction to Social and Cultural Analysis
Fall. 4(3-1) 171.
Basic theoretical framework of socio-cultural analysis; structural functionalism, evolutionism, and cultural ecology.