

ANATOMY

839*. **Systems Neuroscience**
 Spring of odd-numbered years.
 4(04-00) Interdepartmental with the
 Department(s) of Pharmacology and
 Toxicology, Physiology.

Anatomy, Pharmacology and physiology of multicellular neural systems, including major sensory, motor, autonomic and chemo-regulatory systems in brains of vertebrates.

885*. **Vertebrate Neural Systems**
 Spring of odd-numbered years.
 3(02-02) Interdisciplinary with the
 Department(s) of Physiology.

Comparative analysis of major component systems of vertebrate brains, their evolution, ontogeny, structure and function in fish, amphibians, reptiles, birds and mammals
 QA: ANT 885 ANT 886

899*. **Master's Thesis Research**
 Fall, Spring, Summer. 1 to 12 credits.
 P: Admission to M.S. degree program in
 Anatomy R: Anatomy

QA: ANT 899

999*. **Doctoral Dissertation Research**
 Fall, Spring, Summer. 1 to 12 credits.
 P: Admission to Ph.D. program in Anatomy
 R: Anatomy

QA: ANT 999

ANIMAL SCIENCE ANS

110. **Introductory Animal Agriculture**
 Fall. 3(2-2)

History of animal agriculture and its relationship to human needs, production systems, marketing, environmental considerations. Current goals of and limitations affecting U.S. animal production.
 QP: ANS 211

112. **Introductory Animal Management**
 Spring. 3(2-2)
 P: ANS 110.

Principles of managing beef and dairy cattle, horses, poultry, sheep and swine throughout their life cycles. Topics include genetics, nutrition, reproduction, health, care, and economically efficient production.

210*. **Animal Products**
 Fall. 4(3-3)
 P: ANS 110, ANS 112. R: Not open to freshmen.

Edible animal products. Processing, preservation, storage and distribution of dairy, meat, and egg products.
 QP: ANS 110 ANS 211 QA: ANS 156 FSC 300

211. **Animal and Product Evaluation**
 Spring. 3(1-6)

Fundamentals of animal and product evaluation. Skeletal and muscular anatomy of animals and its relation to function. Oral and written defense of decisions regarding evaluation.

212*. **Merchandising Purebred Livestock**
 Spring of odd-numbered years. 2(1-2)
 R: Open only to sophomores, juniors, and seniors.

Purebred livestock industry. Private treaty and auction sales. Advertising, animal selection and budgeting of purebred livestock sales. Field trips required.
 QA: ANS 318

262*. **Sheep Management**
 Spring. 3(2-2)
 R: Open only to sophomores, juniors, and seniors.

Principles of sheep management: genetics, reproduction, nutrition, marketing, and economics. Field trips required.
 QA: ANS 472

300A*. **Livestock Judging**
 Fall of even-numbered years. 2(-)
 P: ANS 211. R: Open only to juniors and seniors.

Evaluation of conformation and performance records of beef cattle, swine and sheep. Represent MSU in intercollegiate competition. Field trips required.
 QP: ANS 357A ANS 357B QA: ANS 357C

300B*. **Meat Evaluation and Grading**
 Fall of odd-numbered years. 2(-)
 P: ANS 211. R: Open only to juniors and seniors.

Evaluation of beef, pork, and lamb carcasses and wholesale cuts according to industry standards. Federal grading standards. Field trips to meat packing operations required. Represent MSU in intercollegiate competition.
 QP: ANS 257A QA: ANS 257B

300C*. **Dairy Cattle Judging**
 Fall. 2(-)
 P: ANS 211. R: Open only to juniors or seniors.

Evaluation of conformation of various breeds of dairy cattle. Represent MSU in intercollegiate competition. Field trips required.
 QP: ANS 211 QA: ANS 337

300D*. **Horse Judging**
 Fall. 2(-)
 P: ANS 211. R: Open only to juniors and seniors.

Evaluation of functional characteristics of horses. Development of oral reasons. Represent MSU in intercollegiate competition. Field trips required.
 QP: ANS 347A QA: ANS 347B

310*. **Livestock and Product Marketing**
 Fall. 3(2-2) Interdepartmental with the Department(s) of Agricultural Economics.
 P: ANS 112 R: Sophomores and above

Movement of livestock into and products through market channels. Market structures, futures, options and current issues. Field trip required.
 QP: ANS 110 ANS 152 QA: ANS 418

313*. **Principles of Animal Feeding and Nutrition**
 Fall. 4(3-2)
 P: CEM 143, PSL 250.

Principles and practices of nutrition for cattle, horses, poultry, sheep and swine. Metabolism of protein, minerals, and vitamins. Diet formulation. Performance prediction. Nutritional maladies. Field trip required.
 QP: CEM 143 PSL 241 QA: ANS 313A ANS313B

314*. **Genetic Improvement of Farm Animals**
 Fall. 4(3-2)
 P: ANS 110, MTH 116. R: Not open to freshmen and sophomores.

Qualitative and quantitative inheritance in domestic farm animals. Statistical concepts and probability related to animal breeding. Improvement of dairy cattle, livestock, and horses through genetics and mating systems.
 QP: ANS 110 MTH 109ORMTH 110OR QA: ANS 314

315*. **Anatomy and Physiology of Farm Animals**
 Spring. 4(3-2)
 P: ANS 112, PSL 250.

Gross and microanatomy of farm animals. Structure directed function of tissues. Endocrine integration for homeostasis. Regulation of growth, lactation, and reproduction. Homeorhesis.
 QP: ANS 211 PSL 241 QA: ANS 315

401*. **Issues in Animal Agriculture**
 Spring. 1(1-0)
 P: ANS 313 or ANS 314 or ANS 315. R: Open only to seniors.

Societal issues related to local, national and international animal agriculture.
 QP: ANS 313AORANS 313BORANS 314 QA: ANS 310

405*. **Endocrinology of Reproduction**
 Fall. 3(3-0)
 P: ANS 315; BCH 200 or BCH 401. R: Not open to freshmen and sophomores.

Endocrine regulation of reproduction. Cellular and molecular aspects of gametogenesis, folliculogenesis, sexual cycles, fertilization, sex differentiation, gestation, and parturition. Technology to regulate reproduction.
 QP: PSL 241 ANDBCH 200ORBCH 401 QA: ANS 455

407*. **Food and Animal Toxicology**
 Fall. 3(3-0) Interdepartmental with the Department(s) of Food Science.
 P: BCH 200 or BCH 401 R: Juniors and above

Fate and effects of chemicals in the food chain including impact on animal production, residues in food products, food safety assessment, and control methods.
 QP: BCH 200 ORBCH 401 QA: ANS 413A

407L*. **Toxicology Methods Laboratory**
 Fall. 2(0-4) Interdepartmental with the Department(s) of Food Science.
 P: ANS 407 or concurrently R: Juniors and above

Laboratory techniques for evaluating potential toxicity of chemicals to living systems. Field trip to industrial toxicology laboratory required.
 QP: ANS 413A QA: ANS 413B

410*. **Critical Analysis of Issues in Animal Science**
 Fall. 2(2-0)
 P: ANS 313 or ANS 314 or ANS 315. R: Open only to seniors.

Traditional animal management practices and evolving technologies. Topics will vary each year.
 QP: ANS 313 ORANS 314ORANS 315

413*. **Non-Ruminant Nutrition**
 Spring. 4(3-2)
 P: ANS 313. R: Not open to freshmen and sophomores.

Nutrition of horses, swine and poultry. Digestive and metabolic development and nutrient requirements. Relationships of genetics, endocrinology, immunology, and environment to nutrition.
 QP: ANS 313B QA: ANS 483 ANS 463

414*. **Advanced Animal Breeding and Genetics**
 Spring. 4(3-2)
 P: ANS 314. R: Not open to freshmen and sophomores.

Application of genetics to animal breeding. Current and potential selection programs and crossbreeding systems of dairy cattle, horse and livestock populations. Expected response to selection methods.
 QP: ANS 314 QA: ANS 454 ANS 434

ANIMAL SCIENCE

- 415*.** **Biology of Growth and Lactation**
 Spring. 3(3-0)
 P: ANS 315. R: Not open to freshmen and sophomores.
 Principles of growth and lactation in food-producing species. Endocrine regulation of bone, muscle, fat, and mammary tissue. Bioenergetic, nutritional, and metabolic aspects of growth and lactation.
 QP: ANS 315 BCH 200ORBCH 401 QA: ANS 416 ANS 435
- 416*.** **Meat Science and Muscle Biology**
 Fall. 2(2-0)
 P: ANS 315. R: Not open to freshmen and sophomores.
 Structure, composition, development and function of muscle and its conversion to meat. Properties of fresh and processed meat. Microbiology, preservation, palatability, inspection and sanitation, nutritive value, and by-products.
 QP: ANS 315 QA: ANS 456
- 417*.** **Topics in Toxicology**
 Spring. 1(1-0) Interdepartmental with the Department(s) of Food Science.
 P: ANS 407 R: Juniors and above
 Selected topics including regulatory toxicology, risk assessment, environmental toxicology, food safety, and safe handling of toxic substances.
 QP: ANS 413A QA: ANS 417
- 422*.** **Beef Cattle Management**
 Fall. 3(2-2)
 P: ANS 313, ANS 314, ANS 315. R: Not open to freshmen and sophomores.
 Management practices and systems for beef herds. Feed requirements, reproduction, breeding, performance testing, housing, and diseases. Costs and returns. Field trips required.
 QP: ANS 313BANS 314ANS 315 QA: ANS 422
- 432*.** **Dairy Cattle Management**
 Fall. 3(2-2)
 P: ANS 313, ANS 314, ANS 315. R: Not open to freshmen and sophomores.
 Management techniques for operating a dairy herd. Mastitis control, reproductive and nutrition management, records, waste management, and facilities. Field trips required.
 QP: ANS313B ANS 314ANS 315 QA: ANS 432
- 442*.** **Horse Management**
 Spring. 3(2-2)
 P: ANS 313, ANS 314, ANS 315. R: Not open to freshmen and sophomores.
 Management of stables and breeding farms. Pedigree and conformational selection, reproduction. Promotion, marketing, economics. Nutrition and feeding, facilities, and herd health. Field trips required.
 QP: ANS 142 ANS 313ANS 314ANS 315 QA: ANS 442
- 455*.** **Avian Physiology**
 Spring. 4(3-3)
 P: ANS 315. R: Open only to seniors and graduate students.
 Systemic and comparative physiology of birds: respiration, reproduction, endocrinology, digestion, urination, and the senses.
 QP: ANS 315 PSL 241 QA: ANS 465
- 472*.** **Swine Management**
 Fall. 3(2-2)
 P: ANS 313, ANS 314, ANS 315. R: Not open to freshmen and sophomores.
 Integrated management practices of swine enterprises. Facilities and environmental needs, genetics, nutrition, reproduction, disease control. Economics and marketing. Field trips required.
 QP: ANS 313BANS 314ANS 315 QA: ANS 482
- 480*.** **Animal Systems in International Development**
 Spring. 3(3-0)
 P: ANS 313, ANS 314, ANS 315. R: Not open to freshmen and sophomores.
 Animal systems in various global regions. Output, land and resource conservation, and socio-economic factors.
 QP: ANS 313BANS 314ANS 315 QA: ANS 488
- 483*.** **Ruminant Nutrition**
 Spring. 4(3-2)
 P: ANS 313, ANS 315. R: Not open to freshmen and sophomores.
 Physiology and metabolism in ruminants. Prehension, digestion, metabolism, absorption, and distribution of nutrients for productive functions. Feeding management strategies and diet formulation. Field trip may be required.
 QP: ANS 313BANDANS 315 QA: ANS 433
- 490*.** **Independent Study**
 Fall, Spring, Summer. 1 to 4 credits.
 May reenroll for a maximum of 8 credits.
 P: ANS 210; ANS 313 or ANS 314 or ANS 315. R: Open only to junior and seniors. Approval of department; application required.
 Independent study in genetics, nutrition, physiology, toxicology, meat science, or management of poultry, livestock, or horses.
 QP: ANS 210 ANDANS313BORANS 314 QA: ANS 400
- 498*.** **Advanced Enterprise Management**
 Spring. 3(2-2)
 P: ANS 422 or ANS 432 or ANS 442 or ANS 472 or concurrently. R: Open only to seniors.
 Husbandry and business management skills applied to commercial livestock enterprise management. Goal-directed decisions and actions. Field trip required.
 QP: ANS 422 ORANS 432ORANS 442
- 499*.** **Senior Thesis in Animal Science**
 Fall, Spring, Summer. 3 to 9 credits.
 May reenroll for a maximum of 9 credits.
 P: ANS 313, ANS 314, ANS 315. R: Open only to seniors. Approval of department; application required. Maximum of 10 credits may be earned in ANS 499 and ANS 490.
 Individual studies in an area of choice with both oral and written final communications. Topic to be determined by student and guidance committee.
 QP: ANS 313BORANS 314ORANS 315 QA: ANS 490
- 511*.** **Animal Industries**
 Fall. 2(2-0)
 P: Admission to the College of Veterinary Medicine. R: College of Veterinary Medicine Veterinary Medicine none
 History of animal agriculture and introduction to animal industries.
 QA: ANS 511
- 513*.** **Veterinary Nutrition**
 Fall. 2(2-0)
 P: Admission to the College of Veterinary Medicine. R: College of Veterinary Medicine Veterinary Medicine none
 Principles of nutrition for livestock, horses, dogs, cats, pets, and wildlife. Comparative digestive metabolism. Nutrients and their metabolism. Nutrition requirements for maintenance, growth, lactation, reproduction and work.
 QA: ANS 513
- 810*.** **Gastrointestinal Microbiology of Domestic Animals**
 Fall. 3(3-0)
 P: MPH 200, BCH 452 or approval of department R: Seniors and Graduate Students
 Microbial ecology of gastrointestinal tract. Microbial role in nutrition, health, productivity. Environmental applications. Livestock species emphasized.
 QP: MPH 200 BCH 452 QA: ANS 830
- 812*.** **Research Techniques in Animal Nutrition and Metabolism**
 Fall of odd-numbered years. 3(1-4)
 P: ANS 313, ANS 314, AND ANS 315 OR Equivalent, or approval of Dept. R: Graduate students only (level 6 and above)
 Methodology in nutrition/metabolism research of livestock. Nutrient analyses, digesta flow kinetics, digestion-balance trials, hormone analyses, tissue culture, enzyme assays, metabolite fluxes, tracer methodology, nucleic acid isolation/analysis.
 QA: ANS 832
- 890*.** **Advanced Independent Study**
 Fall, Spring, Summer. 1 to 4 credits.
 May reenroll for a maximum of 8 credits.
 R: Graduate students Approval of department: Application required
 Investigation of topics within disciplines or species in animal science of special interest to graduate students.
 QA: ANS 800
- 899*.** **Master's Thesis Research**
 Fall, Spring, Summer. 1 to 6 credits.
 May reenroll for a maximum of 6 credits.
 R: Master's candidate in animal science
 Approval of department
 QA: ANS 899
- 936*.** **Protein Nutrition and Metabolism**
 Spring of even-numbered years. 3(3-0)
 Interdepartmental with the Department(s) of Human Nutrition and Foods.
 P: BCH 461, BCH462, One Physiology course, HNF 460 or ANS 313 or dept. approval
 R: Graduate students only (Level 6 and above)
 Nutritional and endocrine regulation of protein synthesis and degradation, protein quality assessment, protein status, protein-energy malnutrition, protein metabolism during exercise, amino acid and protein metabolism, digestion & absorption.
 QP: PSL 811 ORAPPROVAL QA: ANS 936
- 937*.** **Mineral Nutrition and Metabolism**
 Fall of even-numbered years. 3(3-0)
 Interdepartmental with the Department(s) of Human Nutrition and Foods.
 P: One year of BCH (BCH 461,462), one year of PSL, HNF 460 or ANS313 or Approval.
 R: Graduate students only (level 6 and above)
 Forms and locations of mineral elements in the body, metabolic functions, deficiencies and toxicities, interrelationships, quantitative requirements and means of meeting them.
 QP: PSL 811 ORAPPROVALDEPT QA: ANS 937
- 943*.** **Linear Models in Quantitative Genetics**
 Spring. 5(5-0)
 P: ANS 465 R: Graduate Students
 Application of linear models to analyze field data. Estimation of fixed and random factors. Components of variance and covariance. Best linear unbiased prediction of breeding values.
 QP: STT 423 QA: ANS 872 ANS 943

ANIMAL SCIENCE

999*. *Doctoral Dissertation Research*
 Fall, Spring, Summer. 1 to 12 credits.
 May reenroll for a maximum of 24 credits.
 R: Doctoral candidates in Animal Science
 Approval of department

QA: ANS 999 AH 999

ANTHROPOLOGY ANP

101*. *Introduction to Anthropology*
 Fall, Spring. 3(3-0)

Human culture worldwide and throughout human history. Major subfields, methods, theories, and issues. World cultural diversity. Culture and world problems.
 QA: ANP 100 ANP 171

201*. *Sociocultural Diversity*
 Fall, Spring, Summer. 3(3-0)

Origins and diversity of cultural systems. Theories of culture. Patterns of kinship. Religious, economic, and political institutions.
 QA: ANP 171

202*. *Biocultural Evolution*
 Fall, Spring, Summer. 3(3-0)

Nature and function of culture and its relationship to human biology. Principles of change from hominid origins to present.
 QA: ANP 100

220*. *Gender Relations in Comparative Perspective*
 Fall. 3(3-0)

Gender relations in different cultures. Economic and domestic division of labor between the sexes as a factor underlying power differentials.
 QA: ANP 262

264. *Great Discoveries in Archaeology*
 Spring. 3(3-0)

Great discoveries in archaeology that have captured the public's imagination and shaped Western thought, from Olduvai Gorge and Stonehenge to Machu Pichu.
 QP: NONE QA: ANP 264

270*. *Women and Health: Anthropological and International Perspectives*
 Fall. 3(3-0)

Cross cultural perspectives on the health implications of differing life circumstances for women. Women as health-care consumers and providers. Health and women's life cycles.
 QA: ANP 230

280*. *The Anthropological Film*
 Spring. 3(2-2)

Ethnographic film as a record of vanishing cultures, as a tool for ethnological analysis, and as a source of perspectives on different cultures and variability within cultures.
 QA: ANP 210

320*. *Social and Cultural Analysis*
 Fall, Spring. 4(4-0)
 P: ANP 101 or ANP 201.

Major theoretical traditions of cultural anthropology. Functionalism, symbolism, structuralism, and contemporary developments.
 QP: ANP 171 QA: ANP 221

321*. *Anthropology of Social Movements*
 Fall. 3(3-0)
 P: ANP 101 or ANP 201.

How social movements within different cultures around the world organize, create or impede change on the basis of class, religion, race, ethnicity, language, and territory.
 QP: ANP 171 ORANP 221 QA: ANP 388

322*. *Peasants and Social Change in the Developing World*
 Spring. 3(3-0)
 P: ANP 101 or ANP 201.

Cross-cultural perspective on patterns and variations in peasant systems worldwide. Social mechanisms with which they respond to change.
 QP: ANP 171 ORANP 221 QA: ANP 350

340*. *Introduction to Physical Anthropology*
 Fall. 4(3-2)
 P: ANP 101 or ANP 202.

Problems, data, and methods of physical anthropology. Human genetics, hominid evolution, primate studies, human osteology, and human diversity. Field trips at the student's expense may be required.
 QP: ANP 100 QA: ANP 343

360*. *Introduction to Archaeology*
 Fall. 3(3-0)
 P: ANP 101 or ANP 202 or ANP 264.

Theory, methodology, and techniques of archaeology. Applications to questions about past human behavior. History and concepts of archaeology as an anthropological subdiscipline.
 QP: ANP 100 ORANP 264 QA: ANP 263

361*. *Paleolithic Archaeology*
 Fall. 3(3-0)
 P: ANP 101 or ANP 202 or ANP 264 or ANP 360.

Stone Age archaeology from the dawn of tool making to the specialized hunters and cave artists of the late Ice Age.
 QP: ANP 100 ORANP 263ORANP 264 QA: ANP 454

362*. *Evolution of Agrarian Society*
 Spring. 3(3-0)
 P: ANP 101 or ANP 202 or ANP 264 or ANP 360.

R: Not open to freshmen and sophomores. Food production as adaptive strategy. Archaeological evidence for the appearance and development of food production in prehistory. Theories, problems, and issues in the study of food production evolution.
 QP: ANP 100 ORANP 263ORANP 264 QA: ANP 453

363*. *Rise of Civilization*
 Spring. 3(3-0)
 P: ANP 101 or ANP 202 or ANP 264 or ANP 360.

Archaeological evidence for the appearance and development of the world's earliest prehistoric civilizations. The nature of complex societies and the comparative evolution of states.
 QP: ANP 100 ORANP 263ORANP 264 QA: ANP 353

370*. *Culture, Health, and Illness*
 Spring. 3(3-0)
 P: ANP 101 or ANP 201 or ANP 202 or ANP 270 or ANP 320.

Cross-cultural perspectives on the definition and treatment of illness.
 QP: ANP 171 ORANP 100ORANP 221 QA: ANP 356

410*. *Revolution and Social Change in Latin America*
 Fall of even-numbered years. 3(03-0)
 P: ANP 101 or ANP 201 or ANP 320.

R: Not open to freshmen and sophomores. Comparative examination of sociocultural changes leading to and created by major revolutions in Latin America.
 QP: ANP 171 ORANP 221

411*. *North American Indian Ethnography*
 Spring of odd-numbered years. 3(03-00)
 P: ANP 101 or ANP 201 or ANP 320.

Social and cultural patterns of North American Indian societies. History, economy, politics, social organization, religion, and social change.
 QP: ANP 171 ORANP 221 QA: ANP 421

412*. *Social and Cultural Status of Latinos in the U.S.*
 Spring of even-numbered years. 3(3-0)
 P: ANP 101 or ANP 201 or ANP 320 or SOC 101.

R: Not open to freshmen and sophomores. Social and cultural history of Chicanos, Puerto Ricans, Cubans and Central Americans in the United States and their contributions to American society.
 QP: ANP 171 ORANP 221ORSOC 241

413*. *Cultures of Southeast Asia*
 Spring of even-numbered years. 3(03-0)
 P: ANP 101 or ANP 201 or ANP 320.

Southeast Asian peoples, cultures, and nations. Tropical forest and sea trading adaptations. Recent social change.
 QP: ANP 171 ORANP 221 QA: ANP 411

414*. *Anthropology of South Asia*
 Fall of even-numbered years. 3(3-0)
 P: ANP 101 or ANP 201 or ANP 320.

Anthropology of India, Pakistan, Nepal, Bangladesh, and Sri Lanka. Religion, social organization, village life, urban structures, economic organization, history, and social change.
 QP: ANP 171 ORANP 221ORANP 275 QA: ANP 411

415*. *China: Culture and Society*
 Fall of odd-numbered years. 3(3-0)
 P: ANP 101 or ANP 201 or ANP 320.

Socioeconomic and cultural continuity and change from traditional civilization to the contemporary state and the communist period. Village and urban society and their relationships.
 QP: ANP 171 ORANP 221ORANP 275 QA: ANP 412

416*. *Anthropology of Southern Africa*
 Fall of odd-numbered years. 3(03-0)
 P: ANP 101 or ANP 201 or ANP 320.

Structure and organization of major cultures. Transformations caused by global, national, and local forces.
 QP: ANP 171 ORANP 221 QA: ANP 415

417*. *Anthropology of East Africa*
 Spring of even-numbered years. 3(3-0)
 P: ANP 101 or ANP 201 or ANP 320.

Social and cultural organization of the peoples of eastern Africa. Relationships between states and ethnic groups.
 QP: ANP 171 ORANP 221ORANP 281 QA: ANP 415

420*. *Language and Culture*
 Fall, Spring. 3(3-0) Interdepartmental with the Department(s) of English.
 P: ANP 101 OR ANP 201 OR ANP 320

Anthropological approaches to language. How language is used to constitute culture, including roles, ethnicity, and status. Pidgin and creole languages. Cross-cultural communication. Language planning. Methodology. Applications.
 QA: ANP 171 OR ANP 221

421*. *Social Anthropology*
 Fall of odd-numbered years. 3(03-0)
 P: ANP 101 or ANP 201 or ANP 320.

Social structure and social organization. The anthropological understanding of human conduct.
 QP: ANP 171 ORANP 221 QA: ANP 463