ANIMAL AND RANGELAND SCIENCES

Programs in animal sciences provide up-to-date information on methods of rearing livestock and poultry, that produce meat, milk, eggs, wool, and other animal products. In addition, the department addresses the care of animals that enhance human well-being through companionship, recreation, and human aid such as horses and companion animals. Essential to this information is knowledge generated from the fields of animal behavior/bioethics, genetics, nutrition, and physiology. The various teaching and research programs explore modern areas of animal biotechnology and data processing and how they apply to present day livestock and poultry production. Study in these areas provides the core around which various curricula leading to the BS degree in Animal Sciences can be developed. To allow students flexibility in course arrangement, three specialized program options are offered.

Increasing demands for livestock and poultry products by a rapidly expanding human population mean potential employment for well-trained individuals in such areas as farm, ranch, feedlot operation; meat, poultry, egg and milk processing, meat grading with the USDA; Federal Cooperative Extension Service, county and 4-H work; sales or technical employment with commercial feed, seed, and chemical companies and pharmaceutical houses; agricultural loan officer; government agency positions at local, state and federal levels; the Peace Corps; animal welfare auditing; as well as in journalism, mass media, and public policy. The expanding support structure for companion animals has created a growing job market for graduates in areas such as animal behavior consultant; veterinary technician (animal nurse); and business management. In addition, students become prepared to go on to advanced studies in animal sciences, veterinary medicine, and education.

Graduate students may pursue research projects through the Agricultural Experiment Station as part of their programs for MS or PhD degrees. Graduate areas of concentration are offered in animal nutrition, dairy production, embryo physiology, endocrinology, ethology, growth and development, livestock management, muscle biology and meat science, nutritional biochemistry, reproductive physiology.

Cooperative Programs

Students transferring after one or two years at a community college should also be able to complete the requirements for a BS after three or two years, respectively.

Rangeland Sciences

Rangeland sciences is one of the family of natural resources professions important to the social, economic, and political development of Oregon, the nation, and the world. It is based upon ecological principles and is concerned with the restoration, improvement, conservation, and use of rangelands. Since range management is practiced on lands producing domestic and wild animals, timber, water, and recreation, concepts of integrated land use are included in the curriculum. A balance of soil, domestic animal, wildlife, ecology, and other biological sciences is realized in the educational program.

The curriculum below includes university and departmental requirements for the BS degree and provides emphasis either in science, management, ecology, or allied disciplines. The BS degree is also offered on the campus of Eastern Oregon University at La Grande through an extension of the OSU Department of Animal and Rangeland Sciences. Facilities for study include classroom and field-oriented educational environments both on-campus and at locations throughout Oregon. Field trips are taken in conjunction with specific courses.

Graduate work leading to MAIS, MS, or PhD degrees may involve research on domestic or wild animals, rangeland nutrition, community ecology, physiology of rangeland plants, rangeland improvement, rangeland watershed, and riparian zone management, rangeland restoration, utilization and management, agroforestry and landscape ecology.

Summer employment with private industry, government agencies, and on range research projects makes possible learning experiences while earning a salary. Employment opportunities include resource management, research, Extension, ranch management, college and university teaching, business and industrial activities related to rangeland resources, and foreign agricultural and resource development assistance.

The Department of Animal and Rangeland Sciences (https://anrs.oregonstate.edu) is accredited by the Society for Range Management. It is recognized throughout the country as one of the leading institutions of rangeland science.

Undergraduate Programs

Majors

- **Options**
  - Animal Behavior
  - Animal BioHealth/Pre-Professional
  - Animal Production
  - Equine
  - Rangeland Science

- Rangeland Sciences (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/rangeland-sciences-bs-hbs)
- **Options**

Minors

- Rangeland Sciences (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/rangeland-science)
**Graduate Programs**

**Majors**
- Animal Science (MAIS, MS, PhD) (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/animal-science-ms-phd-mais)
- Rangeland Ecology and Management (MAIS, MS, PhD) (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/rangeland-ecology-management-ms-phd-mais)

**Minors**
- Animal Sciences (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/animal-science-graduate-minor)
- Rangeland Science (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/rangeland-science)

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**Faculty**

Professors
- Bohnert, Cherian, Downing, Estill, Filelli, Pirelli

Associate Professors
- Boe, Deboodt, Hermes, Kutzler, Mata-Gonzalez, Schreder, Williams

Assistant Professors
- Arispe, Ates, Bionaz, Bouska, Cruickshank, Dinkins, Duggan, Endress, Morris, Northway, Ochoa, Riggs, Schachtschneider, Udell

Senior Instructors
- Kennedy, Rice

Instructors
- Gibson, Gusee, Hazzard, Monaco, Mueller, Rosenlicht, Shaver, Sherwood

Faculty Research Assistant
- Brummer, Corder, Schroeder

Professionals
- Knudson, Reesman, Spencer

Emeritus Professors
- Borman, Cheeke, Gamroth, Froman, Johnson, Koong, Males, Menino, Thompson, Weber

Distinguished Professor Emeritus
- Stormshak

**Adjunct Faculty**

Kiernec

**Courtesy/Affiliate Faculty**

Associate Professor
- Stringham

Assistant Professors
- Bates, Boyd, Davies, Ganskopp, George, James, Louhaichi, McLean, Sheley, Svejcar

**Animal Science**

ANS 121. *INTRODUCTION TO ANIMAL SCIENCES. (4 Credits)*
Principles of breeding, physiology, nutrition, and management as they apply to modern livestock and poultry production. Lec/lab. (Bacc Core Course)
Attributes: CPBS – Core, Pers, Biological Science
Equivalent to: ANS 121H

ANS 121H. *INTRODUCTION TO ANIMAL SCIENCES. (4 Credits)*
Principles of breeding, physiology, nutrition, and management as they apply to modern livestock and poultry production. Lec/lab. (Bacc Core Course)
Attributes: CPBS – Core, Pers, Biological Science; HNRS – Honors Course Designator
Equivalent to: ANS 121

ANS 207. SOPHOMORE SEMINAR. (2 Credits)
Examination of career opportunities in animal sciences.

ANS 215. BEEF/DAIRY INDUSTRIES. (3 Credits)
Introduction to beef and dairy industries; history, current industry status, and demonstration and practice of basic husbandry skills.

ANS 216. SMALL RUMINANT/SWINE INDUSTRIES. (3 Credits)
Introduction to the small ruminant and swine industries including history, current status and production practices, with demonstration and hands-on experience of basic husbandry practices.

ANS 217. POULTRY INDUSTRIES. (3 Credits)
Familiarization of the organizational structure and marketing arrangement of poultry industries; hands-on managerial techniques, practices and procedures carried out by the poultry industries.

ANS 220. INTRODUCTORY HORSE SCIENCE. (3 Credits)
Introduction to horses, their history, breeds, form and function, performance evaluation, current industry status, and general management.

ANS 223. EQUINE MARKETING. (2 Credits)
Course covers practical concepts of equine marketing. Emphasis on market assessment, targeting buyers, marketing and advertising strategies, hands-on experience in product preparation and presentation, marketing legalities.

ANS 231. LIVESTOCK EVALUATION. (3 Credits)
Focuses on an individual animal’s economic merit as compared to a sample group. Visual appraisal, performance data, and carcass merit are stressed. Includes the evaluation of both market and breeding animals. The livestock species of concentration include beef cattle, swine, sheep, and meat goats. Lec/lab.

ANS 251. PRINCIPLES OF ANIMAL FOODS TECHNOLOGY. (3 Credits)
Processing of meat, milk and eggs into human food products. Lec/lab.

ANS 280. COMPANION ANIMAL MANAGEMENT. (4 Credits)
An introduction to the challenges, responsibilities, and benefits of interaction with selected companion animals. Topics covered will provide an overview of the human-animal bond, the position of companion animals in society, ethical issues of pet ownership and potential career opportunities. In addition, the course will serve as an introduction to preventive care and normal behavior of dogs, cats, and selected exotic pets. As the Department of Animal and Rangeland Sciences curriculum offers courses addressing equine care and husbandry, horses will not be discussed in this class.
ANS 302. COMMON DISEASES OF COMPANION ANIMALS. (4 Credits)
An introduction to common diseases of selected companion animals. Emphasis will be placed on identifying predisposing factors, clinical signs, common diagnostic procedures and potential implications for human health. A $10 course fee will be required. Lec/rec.
Prerequisites: (BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-]) and (BI 213 [D-] or BI 213H [D-]) and CH 121 [D-] and CH 122 [D-] and CH 123 [D-]

ANS 311. PRINCIPLES OF ANIMAL NUTRITION. (3 Credits)
Classification, digestion, absorption, and metabolism of nutrients in animals; consequences of nutritional deficiencies and toxicities. Prerequisites: (BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-])

ANS 312. FEEDSTUFFS AND RATION FORMULATION. (4 Credits)
Presents the feedstuffs utilized by domestic animals including their characteristics and processing. Provides instruction in ration formulation and evaluation leading to development of the basic skills required to formulate and evaluate rations for domestic animals. Taught as a distance education course.

ANS 313. APPLIED ANIMAL NUTRITION: FEEDS AND RATION FORMULATION. (4 Credits)
Discusses topics relevant to feedstuff identification and nutrient analysis, feed processing and formulation of balanced animal diets based on nutrient requirements. Provides students hands-on experiences in identifying various feedstuffs and formulating rations based on the nutrient composition of those feedstuffs. Also offered at EOU and through Ecampus.

ANS 314. ANIMAL PHYSIOLOGY. (4 Credits)
Biological basis of animal performance; describes how networks of cells act cooperatively to enable locomotion, provide a stable internal environment, allocate resources, remove metabolic end-products, and counteract microorganisms.

ANS 315. *CONTENTIOUS SOCIAL ISSUES IN ANIMAL AGRICULTURE. (3 Credits)
Discussion of contentious issues including role of animal products and human health; use of hormones and antibiotics; new animal biotechnologies; animal rights/welfare; livestock grazing on public lands. (Bacc Core Course).
Attributes: CSST – Core, Synthesis, Science/Technology/Society

ANS 316. REPRODUCTION IN DOMESTIC ANIMALS. (4 Credits)
Anatomy and physiology of mammalian and avian reproductive systems; fertilization, embryonic and fetal development, placentaion and parturition; reproductive technologies. Lec/rec.
Prerequisites: (BI 211 with D- or better or BI 211H with D- or better) and (CH 121 [D-] or CH 221 [D-] or CH 231 [D-] or CH 231H [D-])

ANS 317. REPRODUCTION IN DOMESTIC ANIMALS LABORATORY. (1 Credit)
Gross and microscopic anatomy of the reproductive tract; semen collection, evaluation and extension; evaluation of fertilization, embryo and fetal development and placentation. Lec/lab.
Prerequisites: ANS 316 (may be taken concurrently) with D- or better

ANS 320. PRINCIPLES OF COMPANION ANIMAL NUTRITION. (3 Credits)
Learn about nutrients, the digestive process, and the application of nutritional sciences to the health and welfare of companion animals. Introduction to the metabolic basis and practical preventative management for nutritional diseases in companion animals.
Prerequisites: (BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-])

ANS 321. AVIAN EMBRYO. (4 Credits)
Discussion and experimentation involving the development and the environmental requirements for the artificial incubation of avian embryos. Lec/lab. Offered even-numbered years.

ANS 327. APPLIED PHYSIOLOGY OF REPRODUCTION. (5 Credits)
Principles, techniques and recent development in semen collection, evaluation, extension and preservation; artificial insemination, estrus detection and synchronization; pregnancy diagnosis and embryo transfer.
Prerequisites: ANS 316 with D- or better and ANS 317 [D-]

ANS 331. ADVANCED LIVESTOCK EVALUATION. (4 Credits)
Aspects of an individual animal's economic merit are compared to a sample group. Emphasis is placed on beef, swine and sheep. Visual appraisal, performance data and carcass merit are stressed. Designed to prepare students for the intercollegiate livestock judging team. This course is repeatable for 12 credits.

ANS 333. EQUINE STABLE MANAGEMENT. (3 Credits)
Discusses developing a business plan, financial statements, and ratios, budgeting, financial planning, taxation, and employment issues within the current equine industry.
Prerequisites: ANS 220 with D- or better

ANS 335. EQUINE HEALTH AND DISEASE. (3 Credits)
Recognition of common diseases and disorders including their cause, treatment and prevention. Management of internal and external parasites. Recognizing common lameness issues.

ANS 341. ANIMAL BEHAVIOR AND COGNITION. (3 Credits)
Survey, discuss, and explore principles of animal behavior and cognition from a comparative perspective, taking into account the interacting influences of biology, environment, and life experience on the individual and group behavior of animals across species. Aspects of animal cognition, including reasoning, perception, memory and personality, that play an important role in animal behavior will also be addressed.
Prerequisites: BI 102 with D or better or BI 213 with D or better

ANS 351. ADVANCED PRINCIPLES OF ANIMAL FOODS TECHNOLOGY. (4 Credits)
Provides in-depth coverage of both fresh and processed meats and eggs into products suitable for human consumption.

ANS 378. ANIMAL GENETICS. (4 Credits)
Fundamentals of inheritance, principles of genetic segregation, population and quantitative genetics, response to natural selection and artificial manipulation of populations.
Prerequisites: BI 211 with D- or better or BI 212 with D- or better or BI 213 with D- or better

ANS 380. PRINCIPLES OF ANIMAL ANATOMY AND PHYSIOLOGY. (3 Credits)
An introductory course in animal anatomy to provide a foundation for advanced courses in the Animal Science curriculum. Emphasis is on acquisition of a basic knowledge of minute and gross anatomical structures, their operation, and integration. Begins with anatomical nomenclature such as body planes and directional terms then covers the following tissues and organ systems: epithelium, connective tissue, blood and bone marrow, bone/cartilage, muscle tissue, nervous tissue, digestive system, circulatory system, reproductive system, urinary system, and respiratory system.
Prerequisites: (BI 211 with D or better or BI 211H with D or better) and (BI 212 [D] or BI 212H [D]) and (BI 213 [D] or BI 213H [D])
ANS 385. FOUNDATIONS OF MAMMALIAN HISTOLOGY. (3 Credits)
Provides a basic knowledge of mammalian microscopic anatomy. Emphasis will be on the appearance, organization and function of minute anatomical structures that can only be observed with the help of a visual enhancer, such as a microscope. Covers basic histological techniques and histology and related functions of the following tissues and organ systems: epithelium, connective tissue, bone/cartilage, blood, muscle tissue, nervous tissue, circulatory system, digestive system, reproductive system, urinary system, respiratory system, immune system, integument, eye and ear. Also covers gametogenesis, fertilization, and early development of the vertebrate embryo. Lec/lab.
Prerequisites: (BI 211 with C- or better or BI 211H with C- or better) and (BI 212 [C-] or BI 212H [C-]) and (BI 213 [C-] or BI 213H [C-]) and (BI 314 [C-] or BI 314H [C-])

ANS 390. GROSS ANATOMY OF DOMESTIC ANIMALS. (4 Credits)
Provides a foundation for advanced courses in the Animal Sciences curriculum. Emphasis on gaining knowledge of mammalian anatomy. Lectures cover anatomical nomenclature, structure, operation, and integration of major organ systems. The dog is used as the general model while comparative domestic animal anatomy is also covered. Lec/lab.
Prerequisites: (BI 211 with D or better or BI 211H with D or better) and (BI 212 [D] or BI 212H [D]) and (BI 213 [D] or BI 213H [D])

ANS 401. RESEARCH. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

ANS 403. THESIS. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 405. READING AND CONFERENCE. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

ANS 407. SEMINAR. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

ANS 410. ANIMAL SCIENCE INTERNSHIP. (1-12 Credits)
On- or off-campus, occupational work experience supervised by the department. Graded P/N.
This course is repeatable for 16 credits.

ANS 415. LIVESTOCK JUDGING TEAM. (3 Credits)
Designed to train students for participation in the intercollegiate livestock judging team.
This course is repeatable for 9 credits.

ANS 420. ETHICAL ISSUES IN ANIMAL AGRICULTURE. (3 Credits)
Students are provided with an opportunity to discuss, debate and write extensively about current, relevant, and controversial social issues dealing with modern animal agriculture. (Writing Intensive Course)
Attributes: CWIC – Core, Skills, WIC

ANS 430. EQUINE SYSTEMS I: EXERCISE SCIENCE. (4 Credits)
Seniors and graduate students intensively explore and apply science to real-life situations regarding cardiorespiratory, muscle physiology, and bone physiology responses to exercise, climate, and altitude. Lec/lab.

ANS 431. EQUINE SYSTEMS II: NUTRITION. (3 Credits)
Senior and graduate students intensively explore and apply science to real-life situations regarding starch, fiber, protein, and fat metabolism in performance horses, breeding stock, and growing horses.

ANS 432. EQUINE SYSTEMS III: REPRODUCTION. (4 Credits)
Senior and graduate students explore the fundamentals of equine reproduction and their application in horse breeding. Includes practical training of laboratory techniques. Lec/lab.
Prerequisites: ANS 220 with D- or better and ANS 316 [D-]

ANS 433. POULTRY MEAT PRODUCTION SYSTEMS. (3 Credits)
Fundamental applications and the analysis of management principles applied to brooding, rearing, feeding and housing meat-type chickens and turkeys and their respective breeders. Decision case studies and practical management problems are incorporated into the course. Offered odd-numbered years.

ANS 434. EGG PRODUCTION SYSTEMS. (3 Credits)
Applications and analyses of egg production systems for brooding, rearing, feeding and housing egg producing chickens. Decision case studies and practical management problems are incorporated into the course. Offered even-numbered years.

ANS 435. APPLIED ANIMAL BEHAVIOR. (3 Credits)
Exploration of the fundamental processes of animal behavior and implications for animal management, production, housing and welfare. Examples provided in class will cover a range of species, with emphasis on domestic animals. Lec/lab.

ANS 436. SHEEP PRODUCTION SYSTEMS. (3 Credits)
Integration of nutrition, genetics, reproduction, behavior, and health principles into management systems for production and marketing of lamb and wool.

ANS 439. DAIRY PRODUCTION SYSTEMS. (4 Credits)
Fundamentals of nutrition, breeding, reproductive physiology and health programs and their applications in the care and management of dairy cattle.

ANS 440. DAIRY PRODUCTION SYSTEMS. (3 Credits)
Decision case analysis or special topics in application of dairy management principles.
Prerequisites: ANS 439 with D- or better

ANS 441. TOPICS IN ANIMAL LEARNING. (3 Credits)
Explore when and how the behavior of animals can be shaped by the environment, individual experiences, and interactions with other animals (including humans).
Prerequisites: BI 211 with D- or better and BI 212 [D]

ANS 443. BEEF PRODUCTION SYSTEMS: COW/CALF. (4 Credits)
Fundamentals of nutrition, reproductive physiology, health and care, and financial management of beef cow/calf operations in the western U.S. Discussions will focus on critical management stages and practices common to the beef cow/calf production cycle. Taught at EOU La Grande campus only.

ANS 444. BEEF PRODUCTION SYSTEMS: STOCKER/FEEDLOT. (4 Credits)
A continuation of the study of beef cattle management. Content will encompass the growth and development of weaned calves through slaughter for consumer beef production, with particular focus on the management of growing and yearling cattle in forage-based (stocker cattle) and drylot (feedlot) systems. Taught at EOU La Grande campus only.

ANS 445. BEEF PRODUCTION SYSTEMS. (4 Credits)
Students will be exposed to the fundamentals of nutrition, reproductive physiology, selection, health programs, and their applications in the care and management of beef cattle from conception through calving, weaning, stocker/back grounding and the feedlot. Students will practice decision-making processes using working case studies. Overnight field trip with extra fee charged.
ANS 446. GRAZING LIVESTOCK PRODUCTION. (4 Credits)
Equips non-animal science majors with basic ruminant livestock (beef cattle, sheep and meat goat) production knowledge, so they may communicate and collaborate effectively with livestock producers.
Prerequisites: ANS 121 with D- or better

ANS 452. LIVESTOCK HOUSING AND WASTE MANAGEMENT. (3 Credits)
Basics in where, how, and why one would build, insulate, and ventilate livestock buildings. Manure and wastewater collection, treatment, storage, and utilization.

ANS 456. COMPANION ANIMAL PRODUCTION SYSTEMS. (3 Credits)
Fundamentals of dog and cat breeding stock selection, feeding and housing as well as biology and management from estrus through parturition to weaning. Due to the nature of this class, a variety of animals may be present during class session. Questions and interactions are encouraged but, while precautions are taken, any contact with animals carries some risk of injury or illness.
Prerequisites: (ANS 313 with D- or better and ANS 316 (may be taken concurrently) [D-] and ANS 317 (may be taken concurrently) [D-] and ANS 378 [D-])

ANS 460. SWINE PRODUCTION SYSTEMS. (4 Credits)
Students will be exposed to the fundamentals of nutrition, reproductive physiology, selection, health programs, and their applications in the care and management of swine from conception through farrowing, weaning, and the growing/finishing phases. Students will practice decision-making processes using working case studies. Overnight field trip with extra fee charged.

ANS 499. SPECIAL TOPICS. (0-16 Credits)
This course is repeatable for 16 credits.

ANS 501. RESEARCH. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

ANS 503. THESIS. (1-16 Credits)
Graded P/N.
This course is repeatable for 999 credits.

ANS 505. READING AND CONFERENCE. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

ANS 507. GRADUATE SEMINAR. (1 Credit)
Section 1: Seminar/general for all graduate students. Preparation of effective visual aids. Practice explaining the validity or significance of experimental results to an informed audience. Section 2: Seminar/endocrinology, for graduate students interested in physiology.
This course is repeatable for 99 credits.

ANS 508. WORKSHOP. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 509. TEACHING PRACTICUM. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 511. DIGESTIVE PHYSIOLOGY AND NUTRITION OF RUMINANT ANIMALS. (4 Credits)
Anatomy and physiology of the ruminant digestive tract including rumen microbiology and digestive processes. Nutritional biochemistry and physiology of ruminants. Feed chemistry, feed intake and principles of ration balancing. Theory of energy and protein metabolism.

ANS 512. MONOGASTRIC AND POUlTRY NUTRITION. (3 Credits)
Anatomical differences in digestive tracts of monogastrics; nutritional biochemistry of poultry; practical feeding of avian species; least-cost ration techniques; techniques for determining nutrient needs of monogastrics.

ANS 515. REVIEW OF APPLIED RUMINANT NUTRITION RESEARCH TECHNIQUES. (3 Credits)
Review and discussion and applied techniques and methodology used for ruminant nutrition research.

ANS 530. EQUINE SYSTEMS I: EXERCISE SCIENCE. (4 Credits)
Senior and graduate students intensively explore and apply science to real-life situations regarding cardiorespiratory, muscle physiology, and bone physiology responses to exercise, climate, and altitude. Lec/lab.

ANS 531. EQUINE SYSTEMS II: NUTRITION. (3 Credits)
Senior and graduate students intensively explore and apply science to real-life situations regarding starch, fiber, protein, and fat metabolism in performance horses, breeding stock, and growing horses.

ANS 532. EQUINE SYSTEMS III: REPRODUCTION. (4 Credits)
Designed for seniors and graduate students to explore the fundamentals of equine reproduction and their application in horse breeding. Includes practical training in laboratory techniques. Lec/lab.

ANS 533. POULTRY MEAT PRODUCTION SYSTEMS. (3 Credits)
Fundamental applications and the analysis of management principles applied to brooding, rearing, feeding and housing meat-type chickens and turkeys and their respective breeders. Decision case studies and practical management problems are incorporated into the course. Offered odd number years.

ANS 534. EGG PRODUCTION SYSTEMS. (3 Credits)
Applications and analyses of egg production systems for brooding, rearing, feeding and housing egg producing chickens. Decision case studies and practical management problems are incorporated into the course. Offered even-numbered years.

ANS 535. APPLIED ANIMAL BEHAVIOR. (3 Credits)
Exploration of the fundamental processes of animal behavior and implications for animal management, production, housing and welfare. Examples provided in class will cover a range of species, with emphasis on domestic animals. Lec/lab.

ANS 536. SHEEP PRODUCTION SYSTEMS. (3 Credits)
Integration of nutrition, genetics, reproduction, behavior, and health principles into management systems for production and marketing of lamb and wool.

ANS 538. BIOLOGY OF LACTATION. (3 Credits)
Physiological and environmental factors affecting mammary gland development and function. Offered alternate years.

ANS 539. DAIRY PRODUCTION SYSTEMS. (4 Credits)
Fundamentals of nutrition, breeding, reproductive physiology and health programs and their applications in the care and management of dairy cattle.

ANS 540. DAIRY PRODUCTION SYSTEMS. (3 Credits)
Decision case analysis or special topics in application of dairy management principles.

ANS 541. TOPICS IN ANIMAL LEARNING. (3 Credits)
Explore when and how the behavior of animals can be shaped by the environment, individual experiences, and interactions with other animals (including humans).
ANS 543. BEEF PRODUCTION SYSTEMS: COW/CALF. (3 Credits)
Fundamentals of nutrition, reproductive physiology and health programs and their applications in the care and management of beef cattle. Overnight field trip with extra fee charged. Taught at EOU La Grande campus only.

ANS 544. BEEF PRODUCTION SYSTEMS: STOCKER/FEEDLOT. (3 Credits)
Continuation of the study of beef cattle management. Students will practice decision-making processes using area beef cattle operations as case studies. Overnight field trip with extra fee charged. Taught at EOU La Grande campus only.

ANS 545. BEEF PRODUCTION SYSTEMS. (4 Credits)
Students will be exposed to the fundamentals of nutrition, reproductive physiology, selection, health programs, and their applications in the care and management of beef cattle from conception through weaning. Students will practice decision-making processes using working case studies. Overnight field trip with extra fee charged.

ANS 552. LIVESTOCK HOUSING AND WASTE MANAGEMENT. (3 Credits)
Basics in where, how, and why one would build, insulate, and ventilate livestock buildings. Manure and wastewater collection, treatment, storage, and utilization. Offered alternate years.

ANS 556. COMPANION ANIMAL PRODUCTION SYSTEMS. (3 Credits)
Fundamentals of dog and cat breeding stock selection, feeding and housing as well as biology and management from estrus through parturition to weaning. Due to the nature of this class, a variety of animals may be present during class session. Questions and interactions are encouraged but, while precautions are taken, any contact with animals carries some risk of injury or illness.

ANS 560. LIPID METABOLISM. (3 Credits)
Digestion, absorption and metabolism of lipids with emphasis on lipoprotein metabolism, regulation of lipid metabolism in various tissues and metabolism of eicosanoids. Offered alternate years.

ANS 599. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 601. RESEARCH. (1-16 Credits)
Graded P/N. This course is repeatable for 16 credits.

ANS 603. THESIS. (1-16 Credits)
This course is repeatable for 999 credits.

ANS 605. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 606. PROJECTS. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 607. GRADUATE SEMINAR. (1 Credit)
This course is repeatable for 99 credits.

ANS 608. WORKSHOP. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 609. TEACHING PRACTICUM. (1-16 Credits)
This course is repeatable for 16 credits.

ANS 662. HORMONE ACTION. (3 Credits)
Mechanisms of action of peptide and steroid hormones and related compounds at the cellular level. Offered every other year, winter term. CROSSLISTED as MCB 662.
Prerequisites: BB 551 with C or better or BB 592 with C or better

ANS 673. BIOLOGY OF MAMMALIAN REPRODUCTION. (4 Credits)
Physiological, neuroendocrine, endocrine and environmental factors that regulate reproduction of mammals. Offered alternate years.

ANS 699. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.

Rangeland Ecology & Management
RNG 121. INTRODUCTION TO WILDLAND ECOLOGY. (4 Credits)
Ecological principles will be applied to understand contemporary issues related to wildlands, specifically the rangeland biome. Topics include the nature and management of rangelands, integrated land use with emphasis on plant-animal-soil interactions. Prerequisites: BB 551 with C or better or BB 592 with C or better

RNG 299. SPECIAL TOPICS. (1-16 Credits)
Equivalent to: RNG 299H
This course is repeatable for 16 credits.

RNG 299H. SPECIAL TOPICS. (1-16 Credits)
Attributes: HNRS – Honors Course Designator
Equivalent to: RNG 299
This course is repeatable for 16 credits.

RNG 341. RANGELAND ECOLOGY AND MANAGEMENT. (3 Credits)
Nature and management of rangelands. Integrated land use with emphasis on plant-animal-soil interactions.

RNG 351. RANGE ECOLOGY I-GRASSLANDS. (3 Credits)
Principles and terminology of grassland ecology. Addresses the spatial-temporal dynamics of structure, function, and process in North American grassland ecosystems. Water, nutrient cycles and energy pathways are explored in context of the variable driving forces of climate (drought), herbivory, and fire.

RNG 352. RANGE ECOLOGY II-SHRUBLANDS. (3 Credits)
Introduces the ecology of shrublands using an autecological approach. Explores the effects of stressors such as temperature, drought, fire, and herbivory on plant morphology, physiology, reproduction, and growth. Covers life histories of common shrubs and descriptions of shrubland communities used to promote understanding of autecological principles.

RNG 353. WILDLAND PLANT IDENTIFICATION. (4 Credits)
Students will learn how to identify approximately 100 plant species found in wildlands of North America and Mexico. Individual plant species ecology, basic plant anatomy and identification characteristics observable only through a microscope or dissecting scope, and how to use a dichotomous key for plant ID will also be covered.

RNG 355. DESERT WATERSHED MANAGEMENT. (4 Credits)
A systems-based understanding of hydrologic processes in arid and semiarid landscapes. The class is focused on gaining knowledge of multiple ecological and hydrological interactions occurring in dryland watersheds and on discussing practical methodology aimed to enhance site productivity and ecosystem resilience. Emphasis is placed on land use effects on watershed function; monitoring of soil, water, and vegetation variables; and methods of rehabilitation of degraded landscapes. The course has a strong experiential learning component through a series of 'hands-on' practicums and a field trip to a semiarid location in eastern Oregon. Lec/lab.
RNG 399. SPECIAL TOPICS. (1-16 Credits)
May be repeated for a total of 16 credits.
This course is repeatable for 16 credits.

RNG 403. SENIOR THESIS. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 405. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 406. PROJECTS. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 411. ADVANCED PLANT ID. (2 Credits)
Advanced rangeland plant taxonomy.
This course is repeatable for 16 credits.

RNG 421. WILDLAND RESTORATION AND ECOLOGY. (4 Credits)
Emphasis is placed on understanding the ecology of arid and semi-arid ecosystems through the study of ecological processes responsible for ecosystem function. Range improvement practices for stabilizing and repairing degraded wildlands by directing autogenic recovery mechanisms are discussed. This involves manipulating plants, soil, animals and microenvironments for improved ecosystem function.

RNG 430. APPLIED GIS IN RANGELAND SCIENCE. (4 Credits)
Introducing the use of GIS and geospatial information (remote sensing for GIS, GPS, landscape ecology, and cartography principles) in rangeland sciences problem solving and analysis.
Prerequisites: GEO 365 with D- or better or GEOG 360 with D- or better

RNG 441. RANGELAND ANALYSIS. (4 Credits)
Techniques used to describe vegetation in shrub-lands, grasslands, and forests. Use of measurements in resource management. Course is field-oriented, emphasizing both theory and practice of wildland inventory methods.

RNG 442. RANGELAND-ANIMAL RELATIONS. (4 Credits)
Domestic and wild animal use of rangelands as related to environmental factors, palatability, food habits, nutrition, physiography, and their effects on management of rangeland-animal resources.

RNG 455. RIPARIAN ECODYNAMICS AND MANAGEMENT. (4 Credits)
A systems approach to study ecological and hydrological relationships occurring in riparian ecosystems. The class is focused on gaining knowledge of multiple connections between soil, water, and terrestrial vegetation occurring in riparian systems. Emphasis is placed on land use effects on the riparian ecologic and hydrologic function, methods of rehabilitation, and theories of the proper use of riparian ecosystems under a multiple-use philosophy (i.e., fish, wildlife, livestock, aesthetics, recreation, and silviculture).
Prerequisites: RNG 355 with D- or better

RNG 470. PASTORAL SYSTEMS OF THE WORLD. (4 Credits)
Description and evaluation of ecosystems which support grazing animals and pastoralists. Biology, ecology and management of these landscapes will be explored through climate, soils, and plant communities and human-livestock interactions. The historic role of trade and contemporary challenges to the ecological, social and economic sustainability of pastoral systems will be examined.

RNG 490. RANGELAND MANAGEMENT PLANNING. (4 Credits)
Administration and management of rangelands; planning processes involving goal setting, inventories, personnel management, environment, conflict resolution, and other constraints necessary for decision-making. Use of data collected from field problems to support the execution of class plans. Field trip required. Lec/lab.

RNG 499. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 501. RESEARCH AND SCHOLARSHIP. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 503. MASTER’S THESIS. (1-16 Credits)
This course is repeatable for 999 credits.

RNG 505. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 506. PROJECTS. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 507. SEMINAR. (1-2 Credits)
This course is repeatable for 16 credits.

RNG 521. WILDLAND RESTORATION AND ECOLOGY. (4 Credits)
Emphasis is placed on understanding the ecology of arid and semi-arid ecosystems through the study of ecological processes responsible for ecosystem function. Range improvement practices for stabilizing and repairing degraded wildlands by directing autogenic recovery mechanisms are discussed. This involves manipulating plants, soil, animals and microenvironments for improved ecosystem function.

RNG 541. RANGELAND ANALYSIS. (4 Credits)
Techniques used to describe vegetation in shrub-lands, grasslands, and forests. Use of measurements in resource management. Course is field-oriented, emphasizing both theory and practice of wildland inventory methods.

RNG 542. RANGELAND-ANIMAL RELATIONS. (4 Credits)
Domestic and wild animal use of rangelands as related to environmental factors, palatability, food habits, nutrition, physiography, and their effects on management of rangeland-animal resources.

RNG 555. RIPARIAN ECOHYDROLOGY AND MANAGEMENT. (4 Credits)
A systems approach to study ecological and hydrological relationships occurring in riparian ecosystems. The class is focused on gaining knowledge of multiple connections between soil, water, and terrestrial vegetation occurring in riparian systems. Emphasis is placed on land use effects on the riparian ecologic and hydrologic function, methods of rehabilitation, and theories of the proper use of riparian ecosystems under a multiple-use philosophy (i.e., fish, wildlife, livestock, aesthetics, recreation, and silviculture).

RNG 577. AGROFORESTRY. (3 Credits)
Theory and worldwide practice of multiple-crop low input sustainable systems involving concurrent production of tree and agricultural products. Biological, economic, social, and political factors that underlie the application of agroforestry technology. CROSSLISTED as FES 477/ FES 577, NR 477.
Equivalent to: FES 577

RNG 590. RANGELAND MANAGEMENT PLANNING. (4 Credits)
Administration and management of rangelands; planning processes involving goal setting, inventories, personnel management, environment, conflict resolution, and other constraints necessary for decision-making. Use of data collected from field problems to support the execution of class plans. Field trip required. Lec/lab.

RNG 599. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 601. RESEARCH AND SCHOLARSHIP. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 603. PH.D. THESIS. (1-16 Credits)
This course is repeatable for 999 credits.
RNG 605. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 606. PROJECTS. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 607. SEMINAR. (1-2 Credits)
This course is repeatable for 16 credits.

RNG 608. WORKSHOP. (1-16 Credits)
This course is repeatable for 16 credits.

RNG 643. WILDLAND PLANT ECOPHYSIOLOGY. (4 Credits)
Emphasizes the physiological ecology of plants living in arid and semi-arid ecosystems. Primary class emphasis will include photosynthesis, respiration, water stress and water use efficiency, stable isotopes, root structure and function, nutrient uptake and stress, and defoliation. Offered every other winter, odd years.

RNG 662. RANGELAND ECOLOGY. (3 Credits)
Studies ecological theory and related resource management implications in rangelands and arid wildlands. Topics include the history and development of rangeland ecology, plant demography, invasive species, plant population dynamics, disturbance theory, succession, vegetation classification and range condition assessments. Offered every other winter, even years.

RNG 670. ECOLOGICAL INVASIVE PLANT MANAGEMENT. (2 Credits)

RNG 699. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.