The multiple facets of Animal Sciences provide current information on the different production methods involved in the care and management of companion animals, livestock, and poultry. These facets address the production of meat, milk, eggs, wool, and other animal services such as companionship, work, and recreation. In addition, the department addresses the care/well-being of animals as it impacts and enhances the human/animal bond along with the production levels of those animals. Essential to this information is the knowledge generated from the field of animal behavior/bioethics, genetics, nutrition, reproduction, and physiology.

The curriculum designates university and departmental requirements for the BS degree in Animal Sciences. In addition, there are five specialized program options students can choose to pursue. These include: Animal Behavior, Animal BioHealth/Pre-Professional, Animal Production, Equine, and Rangeland Sciences. Diverse teaching and research programs allow students to gain skills, knowledge, and practical experience. This will prepare students graduating from the program to pursue an assortment of employment opportunities. Potential employment areas may include farm and ranch management; product quality assessment of meat, poultry, eggs and milk; the Cooperative Extension Service; sales or technical service with commercial feed, seed, and chemical companies and pharmaceutical firms; agricultural loan officer; government agency positions at local, state, and federal levels; animal welfare auditing; animal behavior consulting; business management; as well as journalism, mass media, and public policy. In addition, students are prepared to go on to advanced studies in animal sciences, veterinary medicine, pharmacy schools, human medicine, nursing schools, dental schools, and education.

Graduate work leading to MS or PhD degrees in Animal Sciences may involve research projects that concentrate on areas such as animal nutrition, dairy production, embryo physiology, endocrinology, growth and development, livestock management, nutritional biochemistry, and reproduction 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 consist of the study and sustainable management of rangelands across a variety of biomes, from arid deserts to mesic grasslands, to tropical savannahs. The program takes an interdisciplinary approach to provide advanced scientific knowledge regarding multiple ecological processes and social drivers influencing rangeland ecosystems around the globe. Students in Rangeland Sciences gain the skills and knowledge needed to fully understand and effectively manage rangelands for improved productivity and enhanced ecosystem resilience. Students graduating from the program will be able to integrate contemporary rangeland ecology and management principles into systems-based decision-making frameworks to promote ecological resilience, sustainable societies, and thriving economies in rangeland ecosystems. The Rangeland Sciences degree program is available in both On-campus and E-campus environments.

The curriculum below includes university and departmental requirements for the BS degree in Rangeland Sciences. Besides the base program, it offers specialization options in Sustainable Rangeland Ecosystem Stewardship, Habitat Management, Pastoral Systems of the World, and Sustainable Livestock Ranching. It also provides the opportunity for doing a minor in the subject of interest for the student (e.g., Animal Sciences).

There are a variety of scholarships and student employment opportunities available to students in the Rangeland Sciences program. There are opportunities all year along for students to gain practical experience in various research projects conducted by faculty in the program. Also, there are several options for summer employment with private industry, government agencies, and on range research projects.

The Rangeland Sciences program is accredited by the professional Society for Range Management (SRM). Accreditation ensures that graduates from the program have the necessary knowledge to join the rangeland science profession regardless of where in the world they may end up launching a job. Accreditation with SRM also helps to build a map to Federal OPM course requirements for multiple 400-series Biological Sciences positions (i.e., 401 Natural Resources Management and Biological Sciences; 408 Ecology Series; 454 Range Management Series; and 457 Soil Conservation Series). This is an important feature of the Rangeland Sciences program as many students go on to careers with federal or state agencies.

Graduate work leading to MAIS, MS, or PhD degrees in Rangeland Sciences may involve research on habitat management and restoration, watershed and riparian systems management, land use-environment relationships, ecohydrology, agroecology, ecophysiology, pastoral systems, and landscape ecology.

Undergraduate Programs
Majors

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

- Rangeland Sciences
  
  **Options:**
  - Habitat Management
  - Pastoral Systems of the World
  - Sustainable Livestock Ranching
  - Sustainable Rangeland Ecosystem Stewardship

Options:

- Animal Behavior
- Animal BioHealth/Pre-Professional
- Animal Production
- Equine
- Rangeland Science
- Habitat Management
- Pastoral Systems of the World
- Sustainable Livestock Ranching
- Sustainable Rangeland Ecosystem Stewardship
Animal and Rangeland Sciences

Minors

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

Graduate Programs

Majors

- Animal Science (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/animal-science-ms-phd/)
- Rangeland Ecology and Management (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/rangeland-ecology-management-ms-phd/)

Minors

- Animal Sciences (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/animal-sciences-graduate-minor/)
- Rangeland Ecology and Management (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/animal-rangeland-sciences/rangeland-ecology-management-graduate-minor/)

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Faculty

Professors Bohnert, Cherian, Downing, Estill, Filley, Johnson
Associate Professors Arispe, Bobe, Bionaz, Endress, Hermes, Kutzler, Mata-Gonzalez, Morris, Ochoa, Schroeder, Udell
Assistant Professors Ates, Bishop, Cruickshank, Dinkins, Duggan, Henderson, Schachtschneider
Senior Instructors Ingham, Johnson, Kennedy, Mueller
Instructors Gibson, Gosse, Hazzard, Monaco, Parker, Rosenlicht, Shaver, Sherwood, Smallman
Faculty Research Assistant Brummer, Corder, Schroeder
Professionals Mills, Reesman, Spencer
Emeritus Professors Borman, Buckhouse, DeBoodt, Cheeke, Gamroth, Froman, Johnson, Koong, Males, Menino, Miller, Pirelli, Thompson, Weber, Williams
Distinguished Professor Emeritus Stormshak

Courtesy/Affiliate Faculty

Associate Professor Stringham
Assistant Professors Bates, Boyd, Davies, Ganskopp, George, James, Louhaichi, McLean, Sheley, Svejcar

Animal Science (ANS)

ANS 100, ORIENTATION TO ANIMAL AND RANGELAND SCIENCES, 1 Credit
Designed to provide incoming Animal and Rangeland Sciences students an introduction to college life at OSU with an emphasis on the faculty, facilities, services, and the curricula of the Department of Animal and Rangeland Sciences.

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
Available via Ecampus

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.
Available via Ecampus

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.
Recommended: ANS 121

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.
Recommended: ANS 121

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.
Recommended: ANS 121
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.
Recommended: ANS 121, ANS 220 and ANS 192

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.
Recommended: ANS 121

ANS 251, PRINCIPLES OF ANIMAL FOODS TECHNOLOGY, 3 Credits
Processing of meat, milk and eggs into human food products. Lec/lab.
Recommended: ANS 121

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.
Available via Ecampus

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.
Prerequisite: ((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-])) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-]) and CH 121 [D-] and CH 122 [D-] and CH 123 [D-])
Recommended: ANS 280
Available via Ecampus

ANS 301, PRINCIPLES OF ANIMAL NUTRITION, 3 Credits
Classification, digestion, absorption, and metabolism of nutrients in animals; consequences of nutritional deficiencies and toxicities.
Prerequisite: ((BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-]) or (BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-]))
Available via Ecampus

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.
Recommended: MTH 111
Available via 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.
Recommended: General principles of biology equivalent to BI 211, BI 212, BI 213 and junior standing or higher
Available via Ecampus

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
Available via Ecampus

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.
Prerequisite: ((BI 211 with D- or better or BI 211H with D- or better) or ((BI 211 with D- or better or BI 211H with D- or better) and (BI 221 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-]) and (CH 121 [D-] or CH 221 [D-] or CH 231H [D-]))
Recommended: ANS 121
Available via Ecampus

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 placentaion. Lec/lab.
Prerequisite: ANS 316 (may be taken concurrently) with D- or better
Available via Ecampus
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.
Prerequisite: BI 211 with D- or better or BI 211H with D- or better and (BI 212 [D-] or BI 212H [D-]) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-]))
Available via Ecampus

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.
Recommended: ANS 121 and ANS 217 and BI 211

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.
Prerequisite: ANS 220 with D- or better
Recommended: ANS 222

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.
Available via Ecampus

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.
Prerequisite: BI 102 with D or better or (BI 213 with D or better or BI 213H with D or better) or ((BI 221 with D or better or BI 221H with D or better) and (BI 222 [D] or BI 222H [D]) and (BI 223 [D] or BI 223H [D]))
Available via Ecampus

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.
Recommended: ANS 251

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.
Prerequisite: BI 211 with D- or better or BI 211H with D- or better or BI 212 with D- or better or BI 212H with D- or better or BI 213 with D- or better or BI 213H with D- or better or BI 221 with D- or better or BI 221H with D- or better or BI 222 with D- or better or BI 222H with D- or better or BI 223 with D- or better or BI 223H with D- or better
Recommended: ANS 121 and ST 351
Available via Ecampus

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.
Prerequisite: ((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])) or ((BI 221 [D] or BI 221H [D]) and (BI 222 [D] or BI 222H [D]) and (BI 223 [D] or BI 223H [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/rec.
Prerequisite: ((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-]) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]) and (BI 223 [C-] or BI 223H [C-])) ) and (BB 314 [C-] or BB 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.
Prerequisite: ((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])) or ((BI 221 [D] or BI 221H [D]) and (BI 222 [D] or BI 222H [D]) and (BI 223 [D] or BI 223H [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 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 427, 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.
Prerequisite: ANS 316 with C or better and ANS 317 [C]
Equivalent to: ANS 327

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.
Recommended: ANS 314

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.
Recommended: ANS 313

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.
Prerequisite: ANS 220 with D- or better and ANS 316 [D-]
Recommended: ANS 327

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 number years.
Recommended: ANS 217 and ANS 313 and ANS 316 and ANS 378

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.
Recommended: ANS 217 and ANS 313 and ANS 316 and ANS 378

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.
Recommended: ANS 314 and BI 350 or Z 350

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.
Recommended: ANS 216 and ANS 311 and ANS 316 and ANS 378

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.
Recommended: ANS 215 and ANS 313 and ANS 316 and ANS 378

ANS 440, DAIRY PRODUCTION SYSTEMS, 3 Credits
Decision case analysis or special topics in application of dairy management principles.
Prerequisite: 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).
Prerequisite: ((BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-]) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-]))
Recommended: ANS 435 or ANS 535 and (BI 350 or Z 350) and BI 213

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.
Recommended: ANS 121 and ANS 313 and (BA 321 or AEC 211)

ANS 444, BEEF PRODUCTION SYSTEMS: STOCKER/FEELOT, 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.
Recommended: ANS 121 and ANS 313 and (BA 321 or AEC 211)

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.
Recommended: ANS 121 and ANS 313 and ANS 316 and ANS 378

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.
Prerequisite: ANS 121 with D- or better
Available via Ecampus

ANS 448, LIVESTOCK PRODUCTION ON PASTURE, 4 Credits
Focuses on grazing management in cultivated pastures in Oregon and other regions with similar agro-ecological conditions. Become familiar with the basic principles of pasture production, grazing management and feed planning and management in large and small ruminant production systems. Provides information on the underlying factors affecting pasture and animal production and product quality in pasture-based production systems. CROSSTLISTED as ANS 448/CROP 448/RNG 448 and ANS 548/CROP 548/RNG 548.
Equivalent to: CROP 448, RNG 448

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.
Available via Ecampus

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.
Prerequisite: (ANS 313 with D- or better and ANS 316 (may be taken concurrently) [D-] and ANS 378 [D-])
Available via Ecampus

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.
Recommended: ANS 121 and ANS 216 and ANS 311 and ANS 316 and ANS 378

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. Recommended: ANS 311 or ANS 313

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. Recommended: ANS 311 and ANS 313

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. Recommended: ANS 314

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. Recommended: ANS 313

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. Equivalent to: BI 532 Recommended: ANS 220 and ANS 316 and ANS 327

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. Recommended: ANS 217 and ANS 313 and ANS 316 and ANS 378

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. Recommended: ANS 217 and ANS 313 and ANS 316 and ANS 378

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. Recommended: ANS 314 and BI 350 or Z 350

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. Recommended: ANS 216 and ANS 311 and ANS 316 and ANS 378

ANS 538, BIOLOGY OF LACTATION, 3 Credits
Physiological and environmental factors affecting mammary gland development and function. Offered alternate years. Recommended: Z 431 or Z 531

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. Recommended: ANS 215 and ANS 313 and ANS 316 and ANS 378

ANS 540, DAIRY PRODUCTION SYSTEMS, 3 Credits
Decision case analysis or special topics in application of dairy management principles. Recommended: ANS 439
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).
Recommended: BI 211 and BI 212 and BI 213 and (ANS 435 or ANS 535) and (BI 350 or Z 350)

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. Lec/lab. Taught at EOU La Grande campus only.
Recommended: ANS 315 and ANS 313 and ANS 316 and ANS 378

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.
Recommended: ANS 443 or ANS 543

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 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.
Recommended: ANS 313 and ANS 316 and ANS 378

ANS 548, LIVESTOCK PRODUCTION ON PASTURE, 4 Credits
Focuses on grazing management in cultivated pastures in Oregon and other regions with similar agro-ecological conditions. Become familiar with the basic principles of pasture production, grazing management and feed planning and management in large and small ruminant production systems. Provides information on the underlying factors affecting pasture and animal production and product quality in pasture-based production systems. Crosslisted as ANS 448/CROP 448/RNG 448 and ANS 548/CROP 548/RNG 548.
Equivalent to: CROP 548, RNG 548

ANS 550, ORGANIC ANIMAL PRODUCTION SYSTEMS, 3 Credits
Topics include the principles of livestock production, legislation, animal welfare, and marketing of organic production systems. Course emphasizes principles, concepts, and techniques of organic and sustainable production of animals.
Available via Ecampus

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.
Recommended: ANS 313 and ANS 378 and completion or concurrent enrollment in ANS 316 and ANS 317

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.
Equivalent to: NUTR 560
Recommended: BB 452 and BB 492

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 99 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.
Prerequisite: BB 551 with C or better or BB 592 with C or better
Equivalent to: PHAR 662
ANS 673, BIOLOGY OF MAMMALIAN REPRODUCTION, 4 Credits
Physiological, neuroendocrine, endocrine and environmental factors that regulate reproduction of mammals. Offered alternate years.
Equivalent to: BI 673
Recommended: ANS 316 and BB 350

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

Rangeland Ecology & Management (RNG)

RNG 121, *INTRODUCTION TO WILDLAND ECOLOGY, 4 Credits
Ecological principles will be applied to understand contemporary issues related to wildlands, specifically the rangeland biomes that comprises over 50% of the Earth's surface (FAO, SRM, USDA ERS). Topics to be covered fall into the following categories: Fundamentals of Ecology; Animals (wildlife & livestock); Disturbance (e.g., invasive species, fire, mineral extraction, etc.); Ecosystem Goods & Services (e.g., carbon sequestration, watersheds, biodiversity, recreation, etc.). The course will largely focus on U.S. wildlands, however a portion will examine the ecology and issues of international rangelands in Africa, Eurasia, Australia, and South America. (Bacc Core Course)
Attributes: CPBS – Core, Pers, Biological Science
Available via Ecampus

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.
Equivalent to: RNG 241
Available via Ecampus

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.
Recommended: (BOT 313 [D-] and RNG 341 [D-])
Available via Ecampus

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.
Recommended: BOT 313 and RNG 341
Available via Ecampus

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.
Equivalent to: RNG 253
Available via Ecampus

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.
Available via Ecampus

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
Available via Ecampus

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. Recommended: Course work in soils and ecology
Available via Ecampus

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. Recommended: ST 351 or ST 351H
Available via Ecampus

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. Available via Ecampus

RNG 448, LIVESTOCK PRODUCTION ON PASTURE, 4 Credits
Focuses on grazing management in cultivated pastures in Oregon and other regions with similar agro-ecological conditions. Become familiar with the basic principles of pasture production, grazing management and feed planning and management in large and small ruminant production systems. Provides information on the underlying factors affecting pasture and animal production and product quality in pasture-based production systems. CROSSLISTED as ANS 448/CROP 448/RNG 448 and ANS 548/CROP 548/RNG 548.
Equivalent to: ANS 448, CROP 448

RNG 455, 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).
Recommended: RNG 355
Available via Ecampus

RNG 457, HABITAT ANALYSIS 1: HABITAT USE AND MOVEMENT, 3 Credits
Effective habitat management necessitates an understanding of how animals use and move through the landscape, including rangelands. This is an advanced undergraduate and introductory graduate course designed to familiarize students with multiple techniques of assessing the influence of habitat on site selection of terrestrial animals (wild and domestic). However, topics covered in this course are broadly analogous to other ecosystems. Emphasis will be placed on analysis of habitat use (space use) and animal movement from multiple study designs. Prerequisite: FW 251 with D- or better and RNG 341 [D-] and MTH 241 [D-] and (ST 201 [D-] or ST 351 [D-])

RNG 458, HABITAT ANALYSIS 2: ABUNDANCE, OCCUPANCY AND DEMOGRAPHY, 3 Credits
Habitat influences abundance, occupancy, and demographic rates of wildlife. Wildlife management is often a component of land management and both benefit from land stewards that have an understanding of how habitat characteristics influence the occupancy, abundance, and performance of wildlife within an area. This is an advanced undergraduate and introductory graduate course designed to familiarize students with multiple techniques of assessing the influence of habitat on abundance, occupancy, and demographic rates of terrestrial animals. Prerequisite: FW 251 with D- or better and RNG 341 [D-] and MTH 241 [D-] and (ST 201 [D-] or ST 351 [D-])

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 affecting decision-making. Use of data collected from field problems to support the execution of class plans. Field trip required. Lec/lab. Available via Ecampus

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.
Available via Ecampus*

### 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.
*Available via Ecampus*

### 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.
*Recommended: ST 351
Available via Ecampus*

### 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.
*Recommended: RNG 341
Available via Ecampus*

### RNG 548, LIVESTOCK PRODUCTION ON PASTURE, 4 Credits
Focuses on grazing management in cultivated pastures in Oregon and other regions with similar agro-ecological conditions. Become familiar with the basic principles of pasture production, grazing management and feed planning and management in large and small ruminant production systems. Provides information on the underlying factors affecting pasture and animal production and product quality in pasture-based production systems. CROSSLISTED as ANS 448/CROP 448/RNG 448 and ANS 548/CROP 548/RNG 548.
*Equivalent to: ANS 548, CROP 548

### 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).
*Recommended: RNG 355
Available via Ecampus*

### RNG 557, HABITAT ANALYSIS 1: HABITAT USE AND MOVEMENT, 3 Credits
Effective habitat management necessitates an understanding of how animals use and move through the landscape, including rangelands. This is an advanced undergraduate and introductory graduate course designed to familiarize students with multiple techniques of assessing the influence of habitat on site selection of terrestrial animals (wild and domestic). However, topics covered in this course are broadly analogous to other ecosystems. Emphasis will be placed on analysis of habitat use (space use) and animal movement from multiple study designs.
*Recommended: ST 511 and ST 512

### RNG 558, HABITAT ANALYSIS 2: ABUNDANCE, OCCUPANCY AND DEMOGRAPHY, 3 Credits
Habitat influences abundance, occupancy, and demographic rates of wildlife. Wildlife management is often a component of land management and both benefit from land stewards that have an understanding of how habitat characteristics influence the occupancy, abundance, and performance of wildlife within an area. This is an advanced undergraduate and introductory graduate course designed to familiarize students with multiple techniques of assessing the influence of habitat on abundance, occupancy, and demographic rates of terrestrial animals.

### 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/NR 477 and FES 577/RNG 577.
*Equivalent to: FES 577, FS 577, NR 577
Recommended: Introductory course in biology

### 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.
Recommended: Basic ecology course

RNG 670, ECOLOGICAL INVASIVE PLANT MANAGEMENT, 2 Credits

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