

ADVANCED LIFE SCIENCE: ANIMALS

Advanced Life Science: Animals is a two-semester course that provides students with opportunities to participate in a variety of activities including laboratory work. Students will explore concepts related to history and trends in animal agriculture as related to animal welfare, husbandry, diseases and parasites, laws and practices relating to handling, housing, environmental impact, global sustainable practices of animal agriculture, genetics, breeding practices, biotechnology uses, and comparative knowledge of anatomy and physiology of animals used in animal agriculture.

Advanced Life Science: Animals prepares students for many careers in agriculture, and more specifically animal science. These careers include but are not limited to: Animal Nutritionist, Animal Scientist, Embryo Technologist, Feedlot Specialist, Livestock Buyer, Livestock Geneticist, Livestock Producer, Meat Science Researcher, USDA Inspector, Veterinarian, and Veterinary Nurse.

Course Specifications

Career and Technical Student Organizations

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education courses. They enhance the knowledge and skills students learn in a course by allowing a student to participate a unique program of career and leadership development. Students in this course should be encouraged to participate in FFA.

Dual Credit

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

Content Standards

Domain - Historic and Current Trends Impacting the Animal Systems Industry

Core Standard 1 Evaluate the development and implications of animal origin, domestication and distribution and assess animal production methods for use in animal systems based on effectiveness.

- ALSA.1.1 Evaluate the implications of animal adaptations on production practices and the environment.
- ALSA.1.2 Predict trends and implications of future developments within different animal industries on production practices and the environment.
- ASLA-1.3 Evaluate the effectiveness of different production methods and defend the use of selected methods using data and evidence.
- ALSA-1.4 Devise and evaluate marketing plans for an animal agriculture product or service.
- ALSA-1.5 Select and defend the use of a specific record management system based upon its effectiveness for a business related to animal systems.
- ALSA-1.6 Devise and evaluate plans to manage wildlife populations to achieve optimal ecological health.

Domain - Global Perspective of Laws and Sustainability

Core Standard 2 Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.

ALSA-2.1 Evaluate the impact of laws pertaining to animal agriculture (e.g., pros, cons, effect on individuals, effect on businesses, etc.) and assess the compliance of production practices with established regulations.

ALSA-2.2 Select, evaluate and defend the use of sustainable practices in animal agriculture.

Domain - Animal Husbandry and Welfare

Core Standard 3 Demonstrate management techniques that ensure animal welfare and analyze procedures to ensure safety of animal products.

ALSA-3.1 Implement and evaluate quality-assurance programs and procedures for animal production.

ALSA-3.2 Devise, implement and evaluate safety procedures and plans for working with animals by species using information based on animal behavior and responses.

ALSA-3.3 Devise economical recommendations to increase the welfare of animals in animal systems.

ALSA-3.3 Select, evaluate and defend the use of specific tools, technology or equipment used to perform animal husbandry and welfare tasks.

ALSA-3.4 Research and evaluate programs to assure the safety of animal products for consumption.

ALSA-3.5 AS.02.02.03.c Evaluate the effectiveness of animal and/or premise identification programs for a given species.

Domain - Animal Nutrition

Core Standard 4 Analyze the nutritional requirements of animals and analyze feed rations to assess their effectiveness

ALSA-4.1 Assess nutritional needs for an individual animal based on its growth stage and production system.

ALSA-4.2 Design and defend the use of a nutritional program by demonstrating the relationship between the nutrient requirements and the feedstuffs provided.

ALSA-4.3 Identify essential and non-essential nutrients. In addition, describe the relationship between amino acids, vitamins and minerals in the health of cells and organs.

ALSA-4.4 Select appropriate feedstuffs for animals based on a variety of factors (e.g., economics, digestive system and nutritional needs, etc.).

ALSA-4.5 Select and utilize animal feeds based on nutritional requirements, using rations for maximum nutrition and optimal economic production.

ALSA-4.6 Make and defend decisions regarding whether to use feed additives and growth promotants after researching and considering scientific evidence, production system needs and goals, and input from industry professionals.

ALSA-4.7 Select, evaluate and defend the use of specific tools or equipment used to perform animal nutrition tasks.

ALSA-4.8 Evaluate and summarize the potential impacts, positive and negative, of compliance and/or noncompliance with a feed label and feeding directions.

ALSA-4.9 Research and recommend technology improvements to provide proper nutrition to animals.

Domain - Animal Reproduction

Core Standard 5 Students evaluate animals for breeding readiness and soundness and apply scientific principles to select and care for breeding animals.

ALSA-5.1 Select breeding animals based on characteristics of the reproductive organs.

ALSA-5.2 Evaluate and select animals for reproductive readiness.

- ALSA-5.3 Treat or cull animals with reproductive problems.
- ALSA-5.4 Summarize the process of sexual maturation
- ALSA- 5.5 Identify and discuss various breeding systems in domesticated animals
- ALSA-5.6 Describe the function of the animal/host defense mechanism
- ALSA-5.7 Discuss the direct and indirect impact of disease on animal health
- ALSA-5.8 Compare and contrast the reproductive organs for male and female domesticated animal species.
- ALSA-5.9 Describe ectoderm, endoderm, and mesoderm as three germ layers that give rise to tissues and organs. Describe blastula and gastrula formation, and the function of morphogens, and recognize their importance in the developmental processes of vertebrates.
- ALSA-5.10 Define and describe estrous cycle(s). Describe how hormones act during the estrous cycle and how they are used to suppress it.
- ALSA-5.11 Discuss the social implications of reproductive and genetic technologies used in animal husbandry (e.g. embryo transfer, artificial insemination, gene transfer, cloning).
- ALSA-5.12 Describe spermatogenesis and sperm motility. List and explain factors that affect both.
- ALSA-5.13 Describe the steps in lactation.
- ALSA-5.14 Describe parturition and the method(s) used to predict when it occurs.
- ALSA-5.15 Select and evaluate a breeding system based on the principles of genetics.
- ALSA-5.16 Select and evaluate breeding animals and determine the probability of a given trait in their offspring.
- ALSA-5.17 Perform a DNA analysis and use the data to make and defend breeding decisions.
- ALSA-5.18 Create a plan to differentiate care of a species of breeding animals throughout their growth stages.
- ALSA-5.19 Describe ways that animals prevent inbreeding, and discuss genetic diversity.
- ALSA-5.20 Compare and contrast natural selection with artificial selection, as used by humans to domesticate animals and breed improved varieties.
- ALSA-5.21 Compare and contrast adaptations of animals for survival in different environmental conditions.
- ALSA-5.22 Describe the role of biotechnology on the process of selection.
- ALSA-5.23 Explain the science behind mammalian cloning. Compare and contrast cloning a gene and an animal.
- ALSA-5.24 Describe the relationship between genotype and phenotype.
- ALSA-5.25 Select animal breeding methods based on reproductive and economic efficiency.
- ALSA-5.26 Evaluate the implementation and effectiveness of artificial insemination techniques.
- ALSA-5.27 Create and evaluate plans and procedures for estrous synchronization, superovulation, flushing, embryo transfer and other reproductive management practices.
- ALSA-5.28 Select and assess animal performance based on quantitative breeding values for specific characteristics.

Domain: Animal Environmental Considerations

Core Standard 6 Students design animal housing, equipment and handling facilities for the major systems of animal production that comply with government regulations and safety standards.

- ALSA-6.1 Design an animal facility focusing on animal requirements, economic efficiency, sustainability, safety and ease of handling.
- ALSA-6.2 Select, use and evaluate equipment, technology and handling procedures to enhance sustainability and production efficiency.

ALSA-6.3 Evaluate facility designs and make recommendations to ensure that it meets standards for the legal, safe, ethical, economical and efficient production of animals.

ALSA-6.4 Evaluate the impact of laws pertaining to animal systems.

Domain: Animal Classification, Anatomy, & Physiology

Core Standard 7 Students classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).

ALSA-7.1 Assess taxonomic characteristics and classify animals according to the taxonomic classification system.

ALSA-7.2 Recommend different uses for an animal species based upon an analysis of local market needs.

ALSA-7.3 Apply knowledge of classification terms to communicate with others about animal systems in an effective and accurate manner.

ALSA-7.4 Define the terms hypertonic, hypotonic, and isotonic. Describe the phenomena of osmosis, and predict the direction that water will move given the concentrations of solutes in adjacent cells.

ALSA-7.5 Describe the biochemistry and functions of animal cell membranes. In doing so, describe the fluid mosaic model of the membrane and the role of the cell membrane proteins in transporting materials in and out of cells.

ALSA-7.6 Describe cellular respiration. Recognize that animals perform only respiration, while plants perform both photosynthesis and respiration. Also, describe the transformation of energy during respiration, and the role of ATP produced in respiration for other metabolic processes.

Core Standard 8 Students apply principles of comparative anatomy and physiology to uses within various animal systems.

ALSA-8.1 Correlate the functions of animal cell structures to animal growth, development, health and reproduction.

ALSA-8.2 Apply the processes of meiosis and mitosis to solve animal growth, development, health and reproductive problems.

ALSA-8.3 Apply knowledge of anatomical and physiological characteristics of animals to make production and management decisions.

ALSA-8.4 Compare and contrast muscle function under anaerobic and aerobic conditions

ALSA-8.5 Identify and explain the major organ systems found in vertebrate systems (Muscular, Skeletal, Circulatory, Respiratory, Digestive, Nervous, Endocrine, Integumentary, Excretory, Urinary, Immune)

ALSA-8.6 Describe the organization of the animal body, cells, tissues, organs, and organ systems

ALSA-8.7 Discuss four basic tissue types: epithelial, connective, muscle, and nervous

Core Standard 9 Students select and train animals for specific purposes and maximum performance based on anatomy and physiology.

ALSA-9.1 Evaluate and select animals to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction

ALSA-9.2 Choose, implement and evaluate sustainable and efficient procedures (e.g., selection, housing, nutrition and management) to produce consistently high-quality animals that are well suited for their intended purposes.

ALSA-9.3 Evaluate and select animals to produce superior animal products based on industry standards.

Domain: Animal Health

Core Standard 10 Students design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.

- ALSA-10.1 Select and use tools and technology to meet specific animal health management goals.
- ALSA-10.2 Determine when an animal health concern needs to be referred to an animal health professional.
- ALSA-10.3 Treat common diseases, parasites and physiological disorders of animals according to directions prescribed by an animal health professional.
- ALSA-10.4 Design and implement a health maintenance and a disease and disorder prevention plan for animals in their natural and/or confined environments.
- ALSA-10.5 Identify and describe surgical and nonsurgical veterinary treatments and procedures to meet specific animal health care objectives.
- ALSA- 10.6 Describe the function of the animal/host defense mechanism
- ALSA- 10.7 Describe the use of antibiotics in animal health, and describe how antibiotics work. Discuss the impact improper use of antibiotics has on antibiotic resistance.
- ALSA- 10.8 Discuss the role of blood in host defense
- ALSA- 10.9 Discuss the impact of disease on animal health.
- ALSA- 10.10 Describe the various parasites and their impact on organ systems. Discuss host specificity and the importance of it.

Core Standard 11 Students analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.

- ALSA-11.1 Design and evaluate a biosecurity plan for an animal production operation.
- ALSA-11.2 Research and evaluate the effectiveness of zoonotic disease prevention methods and procedures to identify those that are best suited to ensure public safety and animal welfare.

Domain: Environmental Impacts of Animal Production

Core Standard 12 Design and implement methods to reduce the effects of animal production on the environment

- ALSA-12.1 Devise a plan that includes measures to reduce the impact of animal agriculture on the environment.
- ALSA-12.2 Apply valid and reliable research evidence to predict the potential effects of different environmental conditions for an animal population.
- ALSA-12.3 Devise and improve plans to establish favorable environmental conditions for animal growth and performance based on a variety of factors (e.g., economic feasibility, environmental sustainability, impact on animals, etc.).

Domain - Leadership

Core Standard 13 Students validate the necessity of leadership skills development in conjunction with participation in The National FFA Organization (FFA) as a critical component to a well-rounded agricultural education.

- ALSA-13.1 Communicate clearly, effectively, and with reason through speaking, writing, visuals, and active listening in formal and informal settings
- ALSA-13.2 Recognize and explain the role of the FFA in the development of leadership, education, employability, communications and human relations skills
- ALSA-13.3 Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment
- ALSA-13.4 Acquire the skills necessary to positively influence others

ALSA-13.5 Develop a skill set to enhance the positive evolution of the whole person

Domain - Supervised Agriculture Experience

Core Standard 14 Students validate the necessity of a Supervised Agricultural Experience (SAE) program as a critical component to a well-rounded agricultural education.

ALSA-14.1 Explain the nature of and become familiar with those terms related to an SAE program

ALSA-14.2 Explore the numerous possibilities for an SAE program which a student might develop

ALSA-14.3 Develop an individual SAE program and implementation plan for record keeping skills

Domain - Careers

Core Standard 15 Students examine the scope of career opportunities in and the importance of agriculture to the economy.

ALSA-15.1 Evaluate the nature and scope of animal sciences in agriculture, society, and the economy

ALSA-15.2 Describe career opportunities and means to achieve those opportunities in animal science

ALSA-15.3 Explain the nature of and become familiar with those terms related to an SAE program

ALSA-15.4 Explore the numerous possibilities for an SAE program which a student might develop