AGRICULTURE & LIFE SCIENCES

Our Website (http://www.cals.vt.edu)

Mission

The college creates, integrates, and shares knowledge to enhance:

- Life sciences, food, and agricultural systems
- The economic prosperity and life quality of the greater community
- The stewardship and health of land, water, and air for future generations
- Student learning through diverse, hands-on, experiential opportunities

Vision

We address current and emerging issues in agricultural and life sciences by building on the land-grant commitment of developing leaders and creating and sharing knowledge through diverse, hands-on applications.

Values

The College of Agriculture and Life Sciences embraces the following core values:

- A commitment to the Virginia Tech Principles of Community
- Freedom of inquiry
- Mutual respect
- Lifelong learning
- *Ut Prosim* (That I May Serve)
- Personal and institutional integrity
- A culture of continuous improvement
- Integrated scholarship across the land-grant missions
- International engagement
- Interdisciplinary collaboration

Undergraduate Programs

In the College of Agriculture and Life Sciences, our ambition to help communities thrive is at the center of our identity. We have identified four major strengths of CALS—food, health, economy, and environment—that we will continue to explore as we seek to help communities thrive. Using these strengths, our work will address many of the grand challenges facing our world, including comprehensive health and wellness, community empowerment, predictive environmental solutions, cultivating lifelong learners, and resilience and efficiency through innovation. There is room for us to excel and grow while focusing on the theme of building thriving communities. By working together, we can all thrive.

The undergraduate program in the college is organized into majors designed for students with widely different interests. These majors permit the student to achieve a satisfactory degree of specialization while providing the fundamentals necessary for continuing professional growth after graduation.

Freshman students may enter the college with the designation LFSC (Exploring Life Sciences). Upon completion of the freshman year, a college major should be selected.

Students who plan to transfer to Virginia Tech and major in the College of Agriculture and Life Sciences after two years of community college enrollment are encouraged to complete as many of the Pathways curriculum courses as possible before they transfer.

Minors Offered

- Agribusiness and Entrepreneurship
- Agricultural and Applied Economics
- Animal and Poultry Sciences
- Commodity and Market Analytics
- Crop and Soil Environmental Sciences
- Dairy Science
- Development and International Trade
- Ecosystems for Human Well-Being
- Entomology
- Environmental Economics
- Environmental Science
- Equine Science
- Fermentation
- Food, Agriculture, and Society
- Food Science and Technology
- Global Food Security and Health
- Horticulture
- Integrative Health and Wellness
- Leadership and Social Change
- Plant Health Sciences
- Teaching and Learning in Agriculture
- Turfgrass Management
- Viticulture
- Wetland Science

College-wide Minors

The college offers three transdisciplinary and experiential-based minors: Food, Agriculture, and Society (FAS), Integrative Health and Wellness (IHW), and Global Food Security and Health (GFSH). The FAS and GFSH are Pathways minors. A cross-campus team of faculty, staff, students, and community partners collaborate to deliver these minors.

Living-Learning Community (LLC) and Residential College (IRC)

Meraki LLC

Students will be encouraged to put their passion, creativity, and soul into finding themselves through well-being.

Leadership and Social Change RC

The mission of the Leadership and Social Change Residential College is to offer students a theoretical foundation combined with the practical knowledge and skills necessary to lead in a complex global environment.

Experiential Learning

Students are encouraged to participate in internship and co-op opportunities to gain relevant work experience prior to graduation. Departmental career advisors can help students identify opportunities. In most cases, students receive credit for qualifying work experience.

Enrichment studies include research field study opportunities, study abroad and summer laboratory experiences outside the university.

Research opportunities and experiencing the excitement of discovery can play an important part in undergraduate training in science. College of Agriculture and Life Sciences departments and schools offer diverse research opportunities in which students may choose to participate. Individuals interested in undergraduate research should contact faculty members in the department or school where they wish to conduct research.

The Academic Programs Office in the college, in cooperation with the Global Education Office, offers several avenues for students both in and outside the college to gain international knowledge and experience. These study opportunities allow students and faculty to become aware of and develop basic knowledge of food, fiber, and environmental issues in the world. Specific activities include study abroad programs and courses, international internships, formal student exchange programs, seminars and workshops on campus, and courses in the college, which focus on international topics. All of the departments in the college offer education abroad opportunities and students wishing to explore these opportunities should contact their advisor.

Advising

Students are assigned an advisor for their major during academic advising and course registration at Virginia Tech. In order to put together a solid plan to finish a degree, advising is critical. Advisors in the College of Agriculture and Life Sciences are among the best resources on campus. In fact, they consistently win awards for the quality of advising they provide. Virginia Tech is a big university, but advisors make it seem like a small town where everyone knows everyone else.

Each year approximately 50% of our graduating students continue their education in graduate or professional school. Pre-health advising (e.g. pre-dentistry, pre-medicine, and pre-veterinary) is coordinated through the Office of Health Professions located in Career and Professional Development.

Career advising is available from a number of sources. The university offers centralized career services and on-campus interviewing. The College of Agriculture and Life Sciences works with employers interested in hiring students with degrees from the college and organizes employer panels and information sessions. The college offers two career fairs each year. The university office of Career and Professional Development also offers several job/career fairs throughout the year, which gives students the opportunity to connect with potential employers.

Career and Professional Development also offers each student access to a computerized program to connect students with potential employers. Undergraduate students who are seeking any type of career-related employment, including internships, co-ops, career-related summer employment, and permanent positions are eligible to use this system.

Scholarships

College and departmental scholarships are available for students enrolled in the College of Agriculture and Life Sciences. Applications are accepted through the University's Scholarship Central. Descriptions and deadlines are available on the Scholarships and Financial Aid website at www.finaid.vt.edu (http://www.finaid.vt.edu).

Honor Societies

Gamma Sigma Delta - Gamma Sigma Delta is an organization having as its objectives the advancement of agriculture in all its phases, the maintenance and improvement of the relations of agriculture and related sciences to other industries, and the recognition of the responsibilities of those engaged in all aspects of agriculture to humankind. Our Society seeks to encourage high standards of scholarship and worthy achievements in all branches of the agricultural and related sciences as well as a high degree of excellence in the practice of agricultural pursuits.

Phi Kappa Phi - Phi Kappa Phi has chapters on nearly 300 select college and university campuses in North America and the Philippines. Membership is by invitation only to the top 10 percent of seniors and graduate students and 7.5 percent of juniors. Faculty, professional staff, and alumni who have achieved scholarly distinction also qualify. The Society's mission is "To recognize and promote academic excellence in all fields of higher education and to engage the community of scholars in service to others."

Phi Beta Kappa - Phi Beta Kappa is the oldest and most prestigious honor society dedicated to recognizing excellence in the liberal arts and sciences. Students in the College of Agriculture and Life Sciences who have exhibited outstanding academic ability in eligible coursework may be eligible for selection to Phi Beta Kappa.

Graduate Programs

All College of Agriculture and Life Sciences departments offer graduate degrees at both the Master and Ph.D. levels. There is also an Online Master of Agricultural and Life Sciences (OMALS) degree program (with 8 different concentrations (https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cals.vt.edu%2Facademic-programs%2Fonline%2Fconcentrations.html&data=05%7C02%7Cataylor%40vt.edu%7C58f7012b6cb44198d4b708dc7917ead2%7C6095688410ad40fa863d4f32c1e3a3%7C0%7C0%7C638518390849955733%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLC%7C0%7C%7C%7C&sdata=D%2BlEvmDltFzjRVJr2OTDIRHLvsKVYUlWQ6rC5NW9geA%3D&reserved=0)) that is an approved accelerated undergraduate to graduate degree (https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.cals.vt.edu%2Facademic-programs%2Fonline%2Facceleratedmasters.html&data=05%7C02%7Cataylor%40vt.edu%7C58f7012b6cb44198d4b708dc7917ead2%7C6095688410ad40fa863d4f32c1e3a3%7C0%7C0%7C638518390849969991%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLC%7C0%7C%7C%7C&sdata=nXeasAb%2FmdwkXdGrM2FtqFSazrs3e1DWD7OjFDrYFko%3D&reserved=0). Complete information on these programs including descriptions of graduate courses can be found in the Graduate Catalog (https://catalog.vt.edu/graduate/).

- Agribusiness Major with Agribusiness Management Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-applied-economics/agribusiness-bs-agribusiness-management/)
- Agribusiness Major with Veterinary Business Management Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-applied-economics/agribusiness-bs-veterinary-business-management/)
- Agricultural and Extension Education Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-leadership-community-education/agricultural-extension-education/)

- Animal and Poultry Sciences Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/animal-sciences/animal-poultry-sciences-bs-science/)
- Animal and Poultry Sciences Major with Behavior and Welfare Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/animal-sciences/animal-poultry-sciences-behavior-welfare-option/)
- Animal and Poultry Sciences Major with Prevet Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/animal-sciences/animal-poultry-sciences-prevet-option/)
- Associate of Agriculture with Applied Agricultural Management Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-technology/associate-agriculture-applied-agricultural-management/)
- Associate of Agriculture with Landscape and Turf Management Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-technology/associate-agriculture-landscape-turf-management/)
- Biochemistry Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/biochemistry/biochemistry-bs/)
- Community Economic Development Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-applied-economics/applied-economic-management-bs-community-economic-development/)
- Community Leadership and Development Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-leadership-community-education/community-leadership-development/)
- Crop and Soil Sciences Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/school-plant-environmental-sciences/crop-soil-sciences/)
- Dairy Science Major with Dairy Business Management Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/animal-sciences/dairy-science-bs-dairy-business-management/)
- Dairy Science Major with Dual Emphasis Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/animal-sciences/dairy-science-dual-emphasis/)
- Dairy Science Major with Science/Prevet Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/animal-sciences/dairy-science-bs-science-prevet/)
- Ecological Restoration Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/school-plant-environmental-sciences/ecological-restoration-bs/)
- Environmental Economics, Management, and Policy Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-applied-economics/applied-economic-management-bs-environmental-economics-management-policy/)
- Environmental Horticulture Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/school-plant-environmental-sciences/environmental-horticulture-bs/)
- Environmental Science Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/school-plant-environmental-sciences/environmental-science-bs/)
- Exercise and Health Sciences Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/human-nutrition-foods-exercise/human-nutrition-foods-exercise-bs-science-food-nutrition-exercise/)
- Food and Health Systems Economics Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-applied-economics/applied-economic-management-bs-food-health-systems-economics/)
- Food Science and Technology Major with Food and Beverage Fermentation Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-fermentation/)
- Food Science and Technology Major with Food and Health Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-food-health/)
- Food Science and Technology Major with Food Business Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-food-business/)
- Food Science and Technology Major with Science Option (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-science-concentration/)
- Integrated Agriculture Technologies Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/school-plant-environmental-sciences/integrated-agriculture-technologies/)
- International Trade and Development Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/agricultural-applied-economics/applied-economic-management-bs-international-trade-development/)
- Landscape Design and Turfgrass Science Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/school-plant-environmental-sciences/landscape-design-turfgrass-science/)
- Nutrition and Dietetics Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/human-nutrition-foods-exercise/human-nutrition-foods-exercise-bs-dietetics/)
- Plant Science Major (https://catalog.vt.edu/undergraduate/agriculture-life-sciences/school-plant-environmental-sciences/plant-science/)

Dean: Mario Ferruzzi
Associate Dean & Director of Academic Programs: Susan S. Sumner
Associate Dean & Director of Virginia Agricultural Experiment Station: Mary Burrows
Associate Dean & Director of Virginia Cooperative Extension: Michael Gutter
Associate Dean & Director of Global Programs: Thomas L. Thompson
Assistant Dean of Academic Programs: Chevon N. Thorpe

Undergraduate Course Descriptions (ALS)

ALS 1004 - Agriculture, the Arts and Society (1 credit)
Interpretive strategies applied to agriculture and the visual arts. Artistic representations of agriculture, farming, rural livelihoods, and agrarian landscapes. Exploration of global agricultural challenges balancing the production of food, fiber, and fuel. Apply principles of design and art using photography medium.
Pathway Concept Area(s): 6A Critique & Practice in Arts, 6D Critique & Prac in Design, 11 Intercultural&Global Aware.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 1014 - Gardens as Art (1 credit)
Interpretive strategies applied to agriculture and gardening design. Artistic representations of agriculture and landscaping. Exploration of global agricultural challenges balancing the production of food, gentrification, and location. Application of principles design and elements of visual art using gardening medium.
Pathway Concept Area(s): 6A Critique & Practice in Arts, 6D Critique & Prac in Design, 11 Intercultural&Global Aware.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 1024 - Digitized Agriculture (1 credit)
Interpretive strategies applied to agricultural art and design. Artistic representations of agriculture and nature. Agriculture through digital art (narrative art, stories, and data visualization). Exploration of global agricultural challenges balancing the production of food, fiber, fuel- and location. Elements, methods of interpreting, and principles and application of art and design using a narrative medium.
Pathway Concept Area(s): 6A Critique & Practice in Arts, 6D Critique & Prac in Design, 11 Intercultural&Global Aware.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 1034 - The Aesthetics of Food (1 credit)
Food as a method of study for art and design. Taste, smell, color, shape, presentation, memory, and packaging of food related to human cultural experience. Food presentation, marketing, and food choices in global context influence how people experience food.
Pathway Concept Area(s): 6A Critique & Practice in Arts, 6D Critique & Prac in Design, 11 Intercultural&Global Aware.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 1234 - CALS First Year Seminar (1 credit)
Exploration of topics related to the College of Agriculture and Life Sciences (CALS) from a multidisciplinary perspective with a focus on communication and teamwork, problem-solving, inquiry, and integration. Students explore resources to promote academic success, investigate careers and academic areas, and develop a comprehensive plan of study. Freshman and transfer students only.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 1984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 1984L - Special Study (1-19 credits)
Pathway Concept Area(s): 6D Critique & Prac in Design
Instructional Contact Hours: Variable credit course

ALS 2204 - Sustainable Food Systems (3 credits)
Introduction to the economic, social, and ecological foundations of civic agriculture. Topics include industrialization, localized food systems, and citizen participation in civic agriculture. Emphasis will be given to a range of civic agriculture models, strategies, and hands-on approaches to establish, retain and strengthen community-based food and agriculture systems, locally- nationally-globally.
Pathway Concept Area(s): 1A Discourse Advanced, 7 Identity & Equity in U.S., 11 Intercultural&Global Aware.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 2304 - Comparative Animal Physiology and Anatomy (4 credits)
Comparative anatomy and physiology of domestic mammals and birds including cell neural, musculoskeletal, respiratory, cardiovascular, urinary, and endocrine systems.
Prerequisite(s): BIOL 1106
Instructional Contact Hours: (3 Lec, 2 Lab, 4 Crd)

ALS 2404 - Biotechnology in A Global Society (3 credits)
Introduction to the world-wide impact of biotechnology and molecular biology, including applications to plants, animals, and microorganisms. Explores basic concepts of genetic engineering, scientific and ethical issues, and public concerns related to biotechnology. Topics include: environmental release of genetically engineering organisms, bioremediation, safety of genetically engineered food products, transgenic plants and animals, gene therapy, and genetic screening.
Prerequisite(s): (BIOL 1015 and BIOL 1016) or (BIOL 1105 and BIOL 1106) or (BIOL 1205H and BIOL 1206H) and (CHEM 1015 and CHEM 1016)
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: BIOL 2404

ALS 2504 - Animals in Society (3 credits)
Animal well-being and behavior, human-animal interactions, ethical responsibilities to animals, animal care, behavior, disease, and pain recognition. Current topics concerning companion animals, domestic animals, and wildlife.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 2604 - Intro to Interdisciplinary Research Practices (3 credits)
Introduction to formal undergraduate research and basic research methods. Engagement in interdisciplinary collaboration via team research projects. Exploration of scholarly literature, topic development, information evaluation, citation and data management, research ethics, and scientific communication. Connections to advanced information and digital literacy topics such as research impact and digital repositories. Formal proposal development and presentation.
Pathway Concept Area(s): 1A Discourse Advanced, 10 Ethical Reasoning
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 2964 - Field Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 2974 - Independent Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 2984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 2984L - Special Study (1-19 credits)
Pathway Concept Area(s): 6D Critique & Prac in Design
Instructional Contact Hours: Variable credit course

ALS 2994 - Undergraduate Research (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 3104 - Animal Breeding and Genetics (3 credits)
Principles of genetics applied to improvement of domestic animals: factors affecting genetic improvement of economically relevant traits, estimation of breeding values, heritability, genetic correlations, relationships, inbreeding, crossbreeding, genetic abnormalities, genomic selection, and gene editing; ethical reasoning in animal breeding decisions.
Prerequisite(s): BIOL 1105 and (STAT 2004 or STAT 3005 or STAT 3615) and (APSC 1454 or DASC 2474 or DASC 2484)
Pathway Concept Area(s): 5A Quant & Comp Thnk Adv., 10 Ethical Reasoning
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 3204 - Animal Nutrition and Feeding (3 credits)
Characteristics, sources, digestion, absorption, and metabolism of water, carbohydrates, lipids, proteins, vitamins, and minerals. Feeding systems for livestock, poultry and companion animals.
Prerequisite(s): ALS 2304 and (CHEM 1036 or CHEM 1036H or CHEM 1016)
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 3304 - Physiology of Reproduction (3 credits)
Physiological mechanisms that control and affect reproductive processes in domestic species. Investigation of the anatomy and physiology of the reproductive systems from cellular to whole-body levels with a particular emphasis on implications for reproductive function.
Prerequisite(s): ALS 2304
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 3314 - Physiology of Reproduction Lab (1 credit)
Investigation of the structure and function of reproductive systems of domestic species. Practical application of this knowledge is then taught through demonstrations, hands-on experiences and assignments exploring current farm-animal production systems.
Corequisite(s): ALS 3304
Instructional Contact Hours: (0 Lec, 3 Lab, 1 Crd)

ALS 3404 - Ecological Agriculture: Theory and Practice (3 credits)
Presents an overview of historic and modern agricultural practices. Surveys the principles of ecology in the context of managed ecosystems, civic agriculture, and food systems. Explores ecologically based practices and their use in holistic and integrated agricultural systems.
Pathway Concept Area(s): 4 Reasoning in Natural Sci., 10 Ethical Reasoning
Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

ALS 3954 - Study Abroad (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 3984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 4204 - Concepts in Community Food Systems (3 credits)
Examination of the economic, political, socio-cultural, health and environmental issues related to community food systems and agricultural practices. Topics include local, regional and global food systems development, food production and biotechnology, food sovereignty and security, and population and environmental health. Analyze models, strategies, and policies within local, national and global food systems.
Prerequisite(s): ALS 2204
Pathway Concept Area(s): 3 Reasoning in Social Sciences, 11 Intercultural&Global Aware.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 4214 - Capstone: Civic Agriculture and Food Systems (3 credits)
Multidisciplinary, experiential community-based course focusing on civic agriculture-food systems. Work in partnership with community stakeholders to propose viable solutions to real world issues revolving around civic agriculture and food systems. Connect with communities locally, regionally or globally.
Prerequisite(s): ALS 2204 and ALS 3404 and ALS 4204
Pathway Concept Area(s): 6D Critique & Prac in Design, 10 Ethical Reasoning
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 4224 - Food, Agriculture, and Society Capstone Seminar (1 credit)
Explore the interplay between food, agriculture, and society from interdisciplinary perspectives. Engage in student-led discussions, presentations, and critical thinking and synthesizing of capstone experiences embedded within the Food, Agriculture, and Society Pathways minor curriculum. Integrate research, study abroad, internships, or other experiential learning initiatives to gain practical insights toward a more just and sustainable food system. Pre: (ALS 2204 and HIST 1084) and any Study Abroad, Independent Study, or Undergraduate Research course regardless of subject designator.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 4244 - Global Food Security and Health Capstone Experience (3 credits)
Food security and its relationship to human and global health challenges. Role of geography, economics, climate, politics, trade, and culture. Ethical issues and challenges to improving global food security and health. Creatively analyze, synthesize, and evaluate learned knowledge. Participate in successful discourse related to global food security and health.
Prerequisite(s): CSES 2244 and AAEC 3204
Pathway Concept Area(s): 1A Discourse Advanced, 10 Ethical Reasoning, 11 Intercultural&Global Aware.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 4554 - Neurochemical Regulation (3 credits)
Neurochemical transmission within the vertebrate brain will be examined. Emphasis will be placed on the chemical coding underlying the control of various behaviors and how these systems can be modified by various drugs or diet.
Prerequisite(s): (ALS 2304 or BIOL 3404) and CHEM 2535
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: BIOL 4554

ALS 4574 - Social Behavior of Birds and Mammals (3 credits)
This course examines origins, influences and implications of social behavior in a variety of avian and mammalian species. Emphasis is placed on understanding group organization and dynamics in inter and intra-species situations. Experimental data from several disciplines (e.g., genetics, physiology, biochemistry) are reviewed to demonstrate their associations with behavioral adaptive mechanisms. Avian and mammalian species living in wild, zoo, agricultural, companion and laboratory settings are discussed.
Prerequisite(s): ALS 3104 or BIOL 2004 and BIOL 1106
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: BIOL 4574

ALS 4614 - Watershed Assessment, Management, and Policy (2 credits)
Multidisciplinary perspectives of assessment, management and policy issues for protecting and improving watershed ecosystems. Topics include: monitoring and modeling approaches for assessment, risk-based watershed assessment geographic information systems for watershed analysis, decision support systems and computerized decision tools for watershed management, policy alternatives for watershed protection, urban watersheds, and current issues in watershed management. Pre: Two 4000 level courses in environmental/natural resource science, management, engineering, and/or policy in BSE, CEE, FOR, FREC, GEOL, LAR, CSES, ENT, BIOL, GEOG, AAEC, UAP or equivalent.
Instructional Contact Hours: (2 Lec, 2 Crd)
Course Crosslist: WATR 4614

ALS 4714 - Global Seminar (1 credit)
Student-centered internet-based course including text and real-time video conferencing among students at collaborating institutions in the United States and Canada. Focus is contemporary North American environmental sustainability issues based on student-prepared case studies. Pre-requisite: Junior or Senior Standing required.
Instructional Contact Hours: (1 Lec, 1 Crd)
Course Crosslist: HORT 4714

ALS 4814 - Nutritional Neuroscience (3 credits)
Concepts in nutritional aspects of neuroscience. Energy metabolism in central nervous system and brain regulating ingestive behavior. Communication with peripheral organs, regulation of whole body energy homeostasis, brain physiology and pathology on molecular and cellular level. Role of appetite neurocircuitry in formulation of practical solutions to societal problems such as nutrition, eating disorders, and obesity.
Prerequisite(s): NEUR 2026 or ALS 2304
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: NEUR 4814

ALS 4964 - Field Study/Practicum (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 4974 - Independent Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 4984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 4994 - Undergraduate Research (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 4994H - Undergraduate Research (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 5024 - Building Multicultural Competence in Agriculture and Life Sciences (1 credit)
Diversity and inclusion within agriculture and life sciences in academic settings and communities: university, national, and global. Virginia Tech Principles of Community and appropriate avenues of redress. Shared responsibilities and issues of privilege, bias, power, prejudice, and discrimination. Governmental and institutional policies and their effects on diversity and inclusion. Pre: Graduate Standing.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 5094 - Effective Grant Writing for the Biomedical aand Behavioral Sciences (1 credit)
The grant writing process and developing student skills for successful grant writing to support research enterprises. Students will prepare a mock research grant proposal for obtaining funds from the National Institutes of Health, National Science Foundation, or the US Department of Agriculture and participate in panel review of grant proposals of peers.
Prerequisite(s): APSC 5004 or (ALS 5064 or BIOL 5064 or BCHM 5064 or PPWS 5064)
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 5104 - Communicating Research and Leadership in Agriculture and Life Sciences (2 credits)
Principles and strategies for effective leadership and communication in agricultural and life sciences (ALS). Analysis, synthesis and translation of research information for use in practical settings. Effective ALS knowledge. Evaluation of research design and methodology in action research. Pre: Graduate standing.
Instructional Contact Hours: (2 Lec, 2 Crd)

ALS 5116 - Nutrition (3 credits)
Digestion, absorption and metabolism of nutrients in animals including humans. 5115: Digestive physiology; digestion and absorption; bioenergetics; and carbohydrate and lipid metabolism with emphasis on substrate sources, interrelationships, and factors affecting utilization and metabolism. Graduate Standing required. 5116: Absorption, metabolism and function with emphasis on physiological and biochemical aspects of protein, amino acid, vitamins, and minerals; epidemiological, biochemical, cellular or molecular methodologies useful for study of macronutrients and micronutrients and their biological functions also will be covered.
Prerequisite(s): ALS 5115
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 5134 - Community-Based Applications of Qualitative Inquiry (3 credits)
Community-based applications of qualitative inquiry in Agricultural and Life Sciences. Qualitative methodology in community-based research with a focus on ethics and inclusivity. Interviews and focus groups. Professional best practices and enhance communication. Best practices for a community approach, interview facilitation, and reporting for professional audiences. Pre: Graduate standing.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 5204 - Research and Information Systems in the Life Sciences (3 credits)
A focus on research techniques and processes for life science professions. Topics include: history of applied life sciences, current structure of the scientific enterprise, the scientific method and quality assurances, researching the literature, scientific writing and presentation of research results, instructional techniques, professionalism, and ethical considerations. Information technology is employed throughout the course. Students learn to use digital technologies for communication, presentation, and publication.
Instructional Contact Hours: (1 Lec, 2 Lab, 3 Crd)

ALS 5214 - Information Systems and Research in the Life Sciences (3 credits)
Research techniques and processes used in the life science professions. History of applied life sciences, structure of the scientific enterprise, the scientific method and quality assurances, researching the literature and critically evaluating information, scientific writing and communication of research results, professionalism, and ethics. Graduate standing required.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 5224 - Introduction to Genomic Data Science (3 credits)
Analysis of genomic data for applications in agriculture and life sciences. Computational tools for genomic data processing and quality control. Interpret results from genomic experiments. Summary statistics, machine learning and methods of visualization for genomic data. High Performance Computing (HPC) systems for genomic analysis. Genomic data analysis pipelines. Pre: Graduate standing.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 5234 - Advanced Concepts in Community Food Systems (3 credits)
Examination of the economic, political, social, and cultural issues related to community food systems and agricultural practices. Local and regional food systems development, food production and biotechnology, food sovereignty and security, and population and environmental health. Analysis of models, strategies, and policies of national food systems. Pre: Graduate Standing.
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 5304 - Advanced Physiology and Anatomy of Domestic Animals (5 credits)
Mammalian physiology and anatomy will be evaluated in domestic animals, laboratory animals, and primates. Emphasis will be on the cardiovascular, renal, respiratory, neural, muscle, and digestive physiology.
Prerequisite(s): ALS 2304
Instructional Contact Hours: (4 Lec, 3 Lab, 5 Crd)

ALS 5324 - Research Ethics in Agriculture and Life Sciences (1 credit)
Principles of and skills development in research ethics to enhance professional preparation in agriculture and life sciences. Pre: Graduate standing.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 5334 - Professional Communication Agriculture and Life Sciences (1 credit)
Principles of, and skill development in, academic communication to enhance professional preparation in the agricultural and life sciences. Pre: Graduate standing.
Instructional Contact Hours: (1 Lec, 1 Crd)

ALS 5404 - Management and Analysis of Agricultural Experiments (3 credits)
Problem-based learning approach to managing, analyzing, and interpreting experimental data common to agricultural research. Programming for statistical software packages and dissection of algorithms to troubleshoot and revise programming code.
Prerequisite(s): STAT 5615 and STAT 5616
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 5904 - Project and Report (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 5954 - Study Abroad (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 5964 - Field Work/Practicum (1-12 credits)
Instructional Contact Hours: (1-12 Lec, 1-12 Crd)
Repeatability: up to 12 credit hours

ALS 5974 - Independent Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 5984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 6314 - Endocrinology (3 credits)
Hormones produced in animals and their roles in development, growth, appetite, digestion, metabolism, lactation, reproduction, homeostasis, and behavior. Mechanisms by which hormones act and the factors that regulate the production and action of hormones. Endocrine disorders and hormone-based application in medicine and animal agriculture. Major methodologies in current endocrine research.
Prerequisite(s): ALS 5304 or ALS 5344
Instructional Contact Hours: (3 Lec, 3 Crd)

ALS 6984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

ALS 7964 - Field Studies (1-12 credits)
Instructional Contact Hours: (1-12 Lec, 1-12 Crd)
Repeatability: up to 12 credit hours