Biology (BIOL)

BIOL F100X Human Biology (n) 4 Credits
Offered Fall As Demand Warrants
Introduction to scientific methodology and biological principles with a focus on humans as biological organisms. Topics include organization of the human body, human genetics, human development and the relationship between our bodies and health. Includes lecture, discussion, lab and projects. May not be used as biology elective credit for a major in biological sciences. Note: Intended for non-science majors and those seeking preliminary instruction before beginning study in health-related areas. Offered through UAF Community and Technical College, eLearning & Distance Education, Northwest and Rural campuses as demand warrants.
Prerequisites: Placement in WRTG F111X or higher; placement in DEV M F105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F103L Biology and Society Laboratory 1 Credit
Offered Spring
A laboratory section only of BIOL F103X designed for transfer students that are non-science majors who have completed a natural science course with no laboratory at another institution. This lab cannot be used as a biology elective by biological science majors.
Prerequisites: A natural science course with no laboratory and permission of instructor.
Lecture + Lab + Other: 0 + 3 + 0

BIOL F103X Biology and Society (n) 4 Credits
Offered Spring; Fall at Northwest Campus
Fundamental principles of biology; emphasis on their application to humans in the modern world. Lectures, laboratory demonstrations, experiments and discussions of contemporary biological topics. For non-science majors; cannot be used as a biology elective by biological science majors.
Prerequisites: Placement in WRTG F111X or higher; placement in DEV M F105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F104X Natural History of Alaska (n, a) 4 Credits
Offered Fall
The physical environment peculiar to the North and important in determining the biological setting; major ecosystem concepts to develop an appreciation for land use and wildlife management problems in both terrestrial and aquatic situations. May not be used as biology elective credit for a major in biological science.
Prerequisites: Placement in WRTG F111X or higher; placement in DEV M F105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F115X Fundamentals of Biology I (n) 4 Credits
Offered Fall
Introduction to the principles of biology for science majors, with emphasis on chemistry of life, cell structure, metabolism, genetics and animal form and function. Students for whom this course is required for their major will be given preference when space is limited.
Prerequisites: Placement in WRTG F111X or higher; placement in MATH F151X or higher; CHEM F105X, may be taken concurrently; or permission of the instructor.
Recommended: High school biology.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F116X Fundamentals of Biology II (n) 4 Credits
Offered Spring
Continuation of topics addressed in BIOL F115X, with emphasis on evolutionary biology, diversity of life, plant form and function and ecology. Students for whom this course is required for their major will be given preference when space is limited.
Prerequisites: Placement in WRTG F111X or higher; placement in MATH F151X or higher; CHEM F105X, may be taken concurrently; BIOL F115X; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F120X Introduction to Human Nutrition 4 Credits
Offered Spring
This course provides students with an understanding of basic nutritional science and how the principles of nutrition can be used to achieve and maintain optimum health and well-being. Students will consider their own food choices in light of the scientific concepts covered in class. May not be used as a biology elective credit for a major in biological sciences.
Prerequisites: Placement in WRTG F111X or higher; placement in DEV M F105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F145 Introduction to Field Entomology (a) 1 Credit
Offered Summer
An introduction to field entomology techniques. Emphasized will be professional procedures to collect and process (sort, mount, and label) non-marine arthropods. The skills necessary to identify most groups to Order will be taught. Students will create a collection from which specimens will be chosen for the University of Alaska Museum Insect Collection and the Teaching Collection. Note: This course cannot be used as a biology elective by biological science majors.
Lecture + Lab + Other: 0.75 + 0.75 + 0

BIOL F150 Introduction to Marine Biology 3 Credits
Survey of marine organisms, evolution of marine life, habitats and communities of ocean zones, productivity and marine resources. For non-science majors; may not be used as biology elective credit for a major in biological science. Only available via eLearning & Distance Education.
Lecture + Lab + Other: 3 + 0 + 0
Biology (BIOL)

BIOL F213X  Human Anatomy and Physiology I  (n)
4 Credits  Offered Fall
Integrated view of human structure and function for students in pre-
professional allied health programs, biology, physical education,
psychology and art. Covers cells, tissues and organs, skeletal and muscle
systems, the nervous system, and integument.
Prerequisites: CHEM F103X or CHEM F105X; placement in WRTG F111X
or higher; placement in DEVM F105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F214X  Human Anatomy and Physiology II  (n)
4 Credits  Offered Spring
Integrated view of human structure and function for students in pre-
professional allied health programs, biology, physical education,
psychology and art. Examines circulatory, respiratory, digestive,
excretory, endocrine and reproductive systems.
Prerequisites: BIOL F213X; CHEM F103X or CHEM F105X; or permission
of instructor.  Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

BIOL F239  Introduction to Plant Biology  (n)
4 Credits  Offered Fall
Plant biology including plant form and function (morphology, physiology and
development), ecology (including interactions with herbivores,
pollinators and microbes), conservation, evolution and economic botany.
Emphasis on vascular plants (particularly angiosperms) but includes
comparisons with nonvascular plants.
Prerequisites: BIOL F115X; BIOL F116X.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F240  Beginnings in Microbiology
4 Credits  Offered As Demand Warrants
Fundamentals of microbiology. Survey of the microbial world,
interactions between microbes and host, microbial human diseases,
the environmental and economic impact of microorganisms. Provides
background in basic and applied microbiology with emphasis on the
role microorganisms play in human health and life. Offered at UAF
Community and Technical College. Note: May not be used as biology
elective credit for a major or minor in biological sciences.
Prerequisites: One course in high school or college-level biology required,
or permission of the instructor.
Recommended: One course in chemistry.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F250  Principles of Genetics
4 Credits
Principles of inheritance; physiochemical properties of genetic systems.
Prerequisites: BIOL F115X; BIOL F116X; CHEM F105X; MATH F151X or
higher; LS F101X or successful completion of library skills competency
test.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F301  Biology of Fishes
4 Credits  Offered Fall
A broad overview of the biological diversity of fishes presented from the
comparative and organismal perspectives. The course examines
the relationship between physical and biological properties of aquatic
environments and the anatomy, physiology, behavior and geographical
distribution of living fish lineages. Topics include fish evolution,
biogeography, classification, gross and fine anatomy, sensory biology,
and form-function relationships. Topics are presented to highlight
essential concepts generally relevant in biology.
Prerequisites: BIOL F115X or equivalent; junior or senior standing.
Cross-listed with FISH F301.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F305  Invertebrate Zoology  (n)
4 Credits  Offered Spring Even-numbered Years
Classification, structure, function, evolution and life histories of invertebrate animals.
Prerequisites: BIOL F115X; BIOL F116X.
Cross-listed with FISH F305, MSL F305.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F310  Animal Physiology  (n)
4 Credits  Offered Spring
Animal function, including respiration, digestion, circulation, nerve and
muscle function, hormones and reproduction.
Prerequisites: BIOL F115X; BIOL F116X; CHEM F105X; CHEM F106X.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F312  Medical Physiology
3 Credits
This course focuses on pathology to teach advanced concepts in human
anatomy and physiology. Case studies and diagnostic problem solving
will be used to promote the application of knowledge. Offer As Demand
Warrants
Prerequisites: BIOL F115X and BIOL F116X; or BIOL F213X and
BIOL F214X; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F331  Systematic Botany  (n)
4 Credits  Offered Spring Odd-numbered Years
Classification of flowering plants with emphasis on Alaskan flora;
familiarity with taxonomy (identification, nomenclature, classification),
evolution (speciation, reproductive biology, adaptation, convergence,
biogeography) and phylogenetics (morphology and molecules). Lab
emphasizes learning representative families and genera of Alaskan flora
using keys and manuals.
Prerequisites: BIOL F239 or permission of instructor.
Recommended: BIOL F260.
Lecture + Lab + Other: 2 + 6 + 0

BIOL F335  Principles of Epidemiology
3 Credits  Offered Spring
Introduction to the basic concepts of epidemiology, with examples from
human to veterinary medicine, including chronic and infectious disease
epidemiology, social epidemiology, outbreak investigation, properties of
tests, and an introduction to study design and surveillance.
Prerequisites: STAT F200X or higher or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

Lecture + Lab + Other: 3 + 3 + 0
BIOL F342  Microbiology  (n)  
4 Credits  
Offered Spring  
Morphology and physiology of microorganisms. The role of these organisms in the environment and their relationship to humans. Concepts of immunology. Laboratory stresses aseptic techniques for handling microorganisms.  
Prerequisites: BIOL F115X; BIOL F116X; CHEM F105X.  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F360  Cell and Molecular Biology  (n)  
3 Credits  
Offered Fall or Spring  
An introduction to the structure and function of cells. Topics include: the structure and function of cellular components, including proteins, membranes and organelles; understanding how cells communicate; and how information is processed in the cell via DNA replication, transcription and translation.  
Prerequisites: BIOL F260; CHEM F105X; CHEM F106X or concurrent enrollment.  
Cross-listed with CHEM F360.  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F371  Principles of Ecology  
4 Credits  
Offered Fall  
Prerequisites: BIOL F115X; BIOL F116X; or permission of instructor.  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F392  Seminar  
1-6 Credits  
Lecture + Lab + Other: 0 + 0 + 1-6

BIOL F392P  Seminar  
1-6 Credits  
Lecture + Lab + Other: 0 + 0 + 1-6

BIOL F400  Capstone Project  
0 Credit  
This course should be taken by students during the semester they initiate a capstone research project. The capstone project may be completed within a designated course or by working individually with a faculty mentor; see the biological sciences program description for more information. The duration of the capstone project may exceed one semester.  
Prerequisites: Junior or senior standing.  
Lecture + Lab + Other: 0 + 0 + 0

BIOL F402  Biomedical and Research Ethics  (W, h)  
3 Credits  
Offered Fall  
Issues in biomedical ethics. Topics will vary but include discussion of moral principles and problems of research ethics and medical ethics, such as: animal and human experimentation; data management; informed consent; therapeutic and non-therapeutic research; physician/patient relationship; autonomy; assisted reproductive technologies; euthanasia; organ transplantation; and allocation of scarce medical resources.  
Prerequisites: WRTG F111X; WRTG F211X or WRTG F213X; junior or senior standing; a course in philosophy, science, or nursing; permission of instructor.  
Recommended: A course in philosophy, science or nursing.  
Cross-listed with PHIL F402.  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F403  Metabolism and Biochemistry  (W)  
4 Credits  
Offered Fall  
Studies of the cells, genomics and proteomics of the nematode Caenorhabditis elegans have become a cornerstone of current biology. Using this simple and facile animal model, students will conduct their own biological investigations and, through this research learning, will gain an understanding of intermediary metabolism. Topics include major pathways of carbon, nitrogen, and lipid metabolism, structure and function of proteins, biological regulation and signaling, and longevity and aging. Student projects in this course may satisfy the capstone project requirement of the biological sciences degree.  
Prerequisites: COMM F121X or COMM F131X or COMM F141X; WRTG F111X; WRTG F211X or WRTG F213X; CHEM F105X; CHEM F106X; BIOL F360 or CHEM F360; or permission of instructor.  
Lecture + Lab + Other: 2 + 2 + 6

BIOL F406  Entomology  (n)  
4 Credits  
Offered Fall Odd-numbered Years  
Biology of insects and related arthropods, with emphasis on evolution, ecology, behavior, biodiversity, morphology and systematics. Lab emphasizes identification and collection.  
Prerequisites: BIOL F115X; BIOL F116X; BIOL F371; or permission of instructor.  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F412  Exercise Physiology  
3 Credits  
Lecture + Lab + Other: 3 + 0 + 0

Biology (BIOL)
BIOL F415  Systematic and Comparative Biology  
4 Credits
Offered Fall Even-numbered Years
Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab.
Prerequisites: BIOL F481.
Stacked with BIOL F615.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F417  Neurobiology  
(O, n)
3 Credits
Offered Spring Even-numbered Years
Organization and function of the vertebrate nervous system from the subcellular to the organismal levels. Neural bases of sensations, specific behaviors and homeostasis. Applications of basic neurobiological research to pathological conditions. Examples taken mostly from the recent vertebrate literature.
Prerequisites: BIOL F310; COJO F131X or COJO F141X; or permission of instructor.
Stacked with BIOL F617.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F418  Biogeography  
(W, n)
3 Credits
Offered Fall
This course explores the geography of life by examining linkages between climate, geomorphology, and ecological communities with emphasis on the biogeography of sub-Arctic, polar and alpine regions.
Prerequisites: BIOL F371 or NRM F277; junior/senior standing; or permission of instructor.
Cross-listed with GEOG F418.
Stacked with BIOL F618; GEOG F618.
Lecture + Lab + Other: 2 + 3 + 0

BIOL F425  Mammalogy  
(W, n)
3 Credits
Offered Fall
Variety of mammals, their behavior, life histories, identification, phylogeny and systematics, morphology, distribution and zoogeography.
Prerequisites: BIOL F115X; BIOL F116X; junior standing or above; or permission of instructor.
Lecture + Lab + Other: 2 + 3 + 0

BIOL F426  Ornithology  
(O/2, W, n)
3 Credits
Offered Spring
Evolution, anatomy, physiology, distribution, migration, breeding biology of birds, their classification and identification.
Prerequisites: BIOL F115X; BIOL F116X; COJO F131X or COJO F141X; WRTG F111X; WRTG F211X or WRTG F213X; or permission of instructor.
Lecture + Lab + Other: 2 + 3 + 0

BIOL F427  Ichthyology  
(n)
4 Credits
Offered Spring
Major groups of fishes, emphasizing fishes of northwestern North America. Classification structure, evolution, general biology and importance to man.
Prerequisites: BIOL F116X.
Cross-listed with FISH F427.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F433  Conservation Genetics  
3 Credits
Offered Spring
Concepts of population genetics, phylogenetics, pedigree analysis, systematics and taxonomy as they apply to conservation of species. Evaluating the impact of small population size, population fragmentation, inbreeding, hybridization, taxonomic uncertainties and other factors on viability and management of species.
Prerequisites: BIOL F371 or equivalent; BIOL F260 or equivalent; or permission of instructor.
Recommended: NRM F277.
Cross-listed with WLF F433.
Stacked with BIOL F633; WLF F633.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F434  Structure and Function of Vascular Plants  
(W)
4 Credits
Offered Spring Odd-numbered Years
Morphology, anatomy and physiology of vascular plants, stressing the interrelationships between development, anatomy, growth, water relations, photosynthesis, transport and metabolism. Student projects in this course may satisfy the capstone project requirement of the biological sciences degree.
Prerequisites: BIOL F115X; F116X; MATH F151X; STAT F200X; WRTG F111X; WRTG F211X or WRTG F213X; junior standing; or permission of instructor.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F435  Introduction to Biology of Cancer  
3 Credits
Course covers current concepts and knowledge of cancer, including cancer research and cancer treatment.
Prerequisites: BIOL F360; or permission of instructor.
Stacked with BIOL F635.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F441  Animal Behavior  
(O/2, W)
3 Credits
Offered Fall
Evolutionary and ecological principles of individual and social behavior, genetic and physiological basis of behavior, techniques of behavioral observation, experimental manipulation and analysis. Design and implementation of independent research project on live animals. Student projects in this course may satisfy the capstone project requirement of the biological sciences degree. Co-requisite: BIOL F481.
Prerequisites: BIOL F310; STAT F200X; COJO F131X or COJO F141X; WRTG F111X; WRTG F211X or WRTG F213X; or permission of instructor.
Lecture + Lab + Other: 2 + 2 + 1

BIOL F455  Environmental Toxicology  
(O)
3 Credits
Offered Fall Even-numbered Years
Environmental toxicology will focus on the general properties and principles of persistent and/or poisonous (toxic) chemicals commonly encountered in air, water, fish and wildlife. Numerous natural and synthetic chemicals in the environment will be discussed from a global perspective with some bias towards Arctic and sub-Arctic regions.
Prerequisites: WRTG F111X; WRTG F211X or WRTG F213X; COJO F131X or COJO F141X; one semester each of organic chemistry and cell or molecular biology; or permission of instructor.
Cross-listed with CHEM F455.
Stacked with BIOL F656; CHEM F655.
Lecture + Lab + Other: 3 + 0 + 0
Biology (BIOL)  

BIOL F456  Winter Ecology  
3 Credits  
Offered Fall  
The focus of this course is on morphological, physiological and behavioral responses of animals and plants to winter conditions. Strategies of avoidance and tolerance of cold temperatures and low resources will be discussed. Analysis of physical and biological processes in seasonally snow-covered ecosystems. Includes principles of radiation and heat exchange, physics and chemistry of snow, thermoregulatory strategies in animals, and discussion of how winter affects trophic dynamics and population processes. 
**Prerequisites:** BIOL F371; or permission of instructor.  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F457  Environmental Microbiology  
3 Credits  
Offered Spring Even-numbered Years  
This course focuses on the role of microorganisms in environmentally-relevant processes including bioremediation of pollutants, biogeochemical cycling, corrosion and wastewater treatment, including current methods for studying microbial diversity and function. Stacked with BIOL F657.  
**Prerequisites:** BIOL F115X; BIOL F116X; BIOL F342; CHEM F105X; CHEM F106X or equivalent; or permission of instructor.  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F460  Principles of Virology  
3 Credits  
Offered Spring  
This course will explore current concepts in the field of virology, with emphasis on the structure, genetic material, and replication strategies of various human and animal viruses. In addition, mechanisms of viral pathogenesis, viral diagnostics, prevention and treatment of viral infection will be presented.  
**Prerequisites:** BIOL F342 or BIOL F360; or permission of instructor.  
*Stacked with BIOL F660.*  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F462  Infectious Diseases  
3 Credits  
Offered Spring Odd-numbered Years  
Covers infectious disease biology using examples of different pathogens and exploring the concepts of their biology and the implication of these principles on pathology, epidemiology and sociology of infectious diseases.  
**Prerequisites:** BIOL F360 or BIOL F342; or permission of instructor.  
*Stacked with BIOL F662.*  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F465  Immunology  
3 Credits  
Offered Fall  
Adaptive immune response including its components and activation from cells to molecules, clonal selection, antigen recognition, and discrimination between foreign and self. Concepts applied on the level of intact organisms addressing allergies, autoimmunity, transplantation, tumors and disease (AIDS).  
**Prerequisites:** BIOL F115X and BIOL F116X and BIOL F310; or BIOL F213X and BIOL F214X; or permission of instructor.  
*Stacked with DVM F606.*  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F466  Advanced Cell and Molecular Laboratory  
3 Credits  
Offered Spring  
Modern molecular biological techniques including protein and nucleic acid gel electrophoresis, western blotting, cell fractionation, cellular respiration, enzymology and fluorescence microscopy. Lectures will be supplemented with reading from the primary literature. Student projects in this course may satisfy the capstone project requirements of the biological science degree. Student must also enroll in BIOL F400 to receive capstone credit. To receive credit, you must not only pass the course, but also receive a passing grade for the capstone project.  
**Prerequisites:** BIOL F360, may be taken concurrent; or permission of instructor.  
*Cross-listed with CHEM F466.*  
Lecture + Lab + Other: 2 + 4 + 0

BIOL F469  Landscape Ecology and Wildlife Habitat  
3 Credits  
Offered As Demand Warrants  
A problem-based learning and critical thinking approach to modern methods in landscape ecology, including geographic information systems, remote sensing, modeling, software and the Internet. Graduate students are expected to help undergraduates with occurring problems and questions.  
**Prerequisites:** BIOL F371 or equivalent; COJO F131X or COJO F141X.  
*Cross-listed with WLF F469.*  
*Stacked with BIOL F669; WLF F669.*  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F471  Population Ecology  
3 Credits  
Offered Spring  
Biology of populations of plants and animals, including population structure, natality, mortality, population growth, regulation of population size, population interactions in competition, herbivory, predation and parasitism.  
**Prerequisites:** A calculus course; BIOL F371.  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F472  Community Ecology  
3 Credits  
Offered Fall Even-numbered Years  
Structure of plant and animal communities and their organization. Structuring forces of competition, predation, herbivory, mutualisms, and the flow of energy and nutrients. Latitudinal gradients in species richness and biogeography. Student projects in this course may satisfy the capstone project requirement of the biological sciences degree.  
**Prerequisites:** BIOL F371; WRTG F111X; WRTG F211X or WRTG F213X; or permission of instructor.  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F473  Limnology  
3 Credits  
Offered Fall  
The ecology of inland waters emphasizing lakes and rivers. Lecture provides graphically oriented view of concepts. Laboratory involves team-based original research from proposal to manuscript. Student projects in this course may satisfy the capstone project requirement of the biological sciences degree.  
**Prerequisites:** BIOL F115X; BIOL F116X; BIOL F371; CHEM F105X; CHEM F106X; WRTG F111X; WRTG F211X or WRTG F213X or permission of instructor.  
Lecture + Lab + Other: 2 + 3 + 0
BIOL F476  Ecosystem Ecology  (O, n)
3 Credits
Offered Fall Odd-numbered Years
Focus on the biological and physical principles that govern functioning of terrestrial ecosystems. Emphasis on how plants, animals and microorganisms control the movement of water, carbon and nutrients through ecosystems. Includes discussion of scientific literature and collection of original data.
Prerequisites: WRTG F111X; WRTG F211X or WRTG F213X; COJO F131X or COJO F141X; BIOL F371; STAT F200X; or permission of instructor.
Lecture + Lab + Other: 3 + 0.5 + 0

BIOL F481  Principles of Evolution
4 Credits
Patterns and processes of evolutionary change are used to explore the unifying principles of the biological sciences. Basic models of population genetics, quantitative genetics, development, phylogenetics and systematics are used to build a conceptual framework for study of living systems. Note: STAT F200X may be taken concurrently.
Prerequisites: BIOL F260; STAT F200X; junior standing; or permission of instructor.
Stacked with BIOL F681.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F483  Stream Ecology
3 Credits
Offered As Demand Warrants
The ecology of streams and rivers focusing on physical, chemical and biological processes.
Prerequisites: BIOL F115X; BIOL F116X; BIOL F371.
Recommended: CHEM F105X; CHEM F106X.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F485  Global Change Biology  (W, n, a)
3 Credits
Offered Fall
Causes of climate change, the climate record, and the effects of past and forecast climate change on biophysical systems. Consideration of impacts on plants, animals, ice, and people with an emphasis on Alaska and the Arctic.
Prerequisites: BIOL F371; CHEM F105X; CHEM F106X; WRTG F111X; WRTG F211X or WRTG F213X; or permission of instructor.
Cross-listed with WLF F485.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F486  Vertebrate Paleontology  (n)
3 Credits
Offered Spring Odd-numbered Years
The study of vertebrate evolution through geologic time. Covers the temporal range, diversity and systematics of major vertebrate groups as documented in the fossil record, with an emphasis on current problems in vertebrate evolutionary pattern and process. Labs emphasize comparative morphology and identification of major vertebrate groups.
Prerequisites: BIOL F310 or GEOS F315 or permission of instructor.
Cross-listed with GEOS F486.
Stacked with GEOS F686; BIOL F686.
Lecture + Lab + Other: 2 + 3 + 0

BIOL F487  Conceptual Issues in Evolutionary Biology
3 Credits
Offered Spring Odd-numbered Years
Analysis of some of the main models which explain evolutionary change, followed by consideration of the practical implications these models have on the study of biological phenomena in general.
Cross-listed with PHIL F487.
Stacked with BIOL F687; PHIL F687.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F488  Arctic Vegetation Ecology: Geobotany
3 Credits
Offered Spring Even-numbered Years
Arctic plants in relationship to Earth, including Arctic plant identification, climate, geology and geography controls on Arctic plant communities, snow ecology, applications to wildlife studies and current Arctic issues. Consists of lecture, labs and 1 winter field trip.Stacked with BIOL F688
Prerequisites: BIOL F115 and BIOL F116 or equivalent; BIOL F239 or BIOL F371; or permission of instructor.
Lecture + Lab + Other: 3 + 1 + 0

BIOL F489  Vegetation Description and Analysis
3 Credits
Offered Fall Even-numbered Years
Methods of vegetation science including sampling, classification, gradient analysis, ordination, field description and mapping. Field trips to the plant communities of interior Alaska.Stacked with: BIOL F689
Prerequisites: BIOL F239 or BIOL F233 or BIOL F371 or BIOL F331; or permission of instructor.
Lecture + Lab + Other: 2 + 3 + 0

BIOL F490  Research Experience in Biology  (W)
3 Credits
Offered Spring
Provides undergraduate opportunities for student research in advanced life science topics beyond typical undergraduate laboratory or course offerings. Students are required to publicly present their work and submit a final report summarizing their work and suitable as a component of a submission to a discipline-specific journal. Research areas range across all life sciences subjects (evolution, ecology, physiology, cell biology, biochemistry, molecular biology, etc.). A substantial level of background in the specific discipline, a level commensurate with having achieved junior or senior standing, is assumed.
Prerequisites: CHEM F105X; CHEM F106X; BIOL F115X; BIOL F116X; or permission of instructor.
Lecture + Lab + Other: 1 + 0 + 6

BIOL F492  Seminar
1-6 Credits
Lecture + Lab + Other: 0 + 0 + 0

BIOL F492P  Seminar
1-6 Credits
Lecture + Lab + Other: 0 + 0 + 0

BIOL F495  Special Topics
1-6 Credits
Lecture + Lab + Other: 1-6 + 0 + 0

BIOL F498  Research
1-6 Credits
Lecture + Lab + Other: 1-6 + 0 + 0
BIOL F602  Research Design
3 Credits
Offered Fall
An introduction to the philosophy, performance and evaluation of hypothetical/deductive research in the biological sciences, with emphasis on hypothesis formulation and testing. Each student will develop a research proposal.
Prerequisite: Graduate standing or permission of instructor.
Cross-listed with WLF F602.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F604  Scientific Writing, Editing, and Revising in the Biological Sciences
3 Credits
Offered Spring
For students who are ready to produce a manuscript or thesis chapter. Topics include the publishing process (e.g., the role of editors and reviewers), preparing to write (selecting a journal, authorship), the components of the scientific paper, revising and editing manuscripts, and responding to reviews. Students will produce a complete manuscript.
Prerequisites: Graduate standing in Biology, Wildlife, or related discipline and permission of instructor.
Cross-listed with WLF F604.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F605  Animal Stable Isotope Ecology
3 Credits
Offered Spring Odd-numbered Years
Recent primary literature in stable isotope ecology, which uses naturally occurring variation in stable isotopes of carbon, nitrogen, oxygen, hydrogen and sulphur as markers of organismal and ecological processes. The focus will be on animal studies, including diet reconstruction, mixing models, food web, metabolism, nutrient allocation and migration.
Prerequisite: Graduate standing; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F612  Exercise Physiology
3 Credits
Physiology responses and adaptation to exercise in humans, emphasizing energy metabolism, adipose and lean tissue, central and peripheral components of oxidative metabolism and the environmental influences on these parameters.
Prerequisites: Graduate standing; or permission of instructor.
Stacked with BIOL F412.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F613  Resilience Internship
2 Credits
Offered Fall
Students of the Resilience and Adaptation Program participate in internships to broaden their interdisciplinary training, develop new research tools, and build expertise outside their home disciplines. Internships are for eight to ten weeks of full time commitment and take place during the student's first summer in the program. In the autumn students meet to discuss their internship experiences and make public presentations.
Prerequisites: ANTH/BIOL/ECON/NRM F667; ANTH/BIOL/ECON/NRM F668; or permission of instructor.
Cross-listed with ANTH F617; ECON F613; NRM F613.
Lecture + Lab + Other: 2 + 0 + 0

BIOL F615  Systematic and Comparative Biology
4 Credits
Offered Fall Even-numbered Years
Concepts of systematic biology basic to a rigorous and complete understanding of modern evolutionary theory. Systematics provides the historical framework critical to a variety of comparative analyses in biology. Recent innovations in phylogenetic analyses will be explored in lecture and lab
Prerequisites: Graduate standing; or permission of instructor.
Stacked with BIOL F415.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F616  Ecological Background for Resilience and Adaptation
1 Credit
Offered Fall
Provides the ecological background that is necessary for understanding the role of ecology in complex systems involving interactions among biological, economic, and social processes. Designed for incoming students of the Resilience and Adaptation Program (RAP), who have not received training in ecology.
Prerequisites: Graduate standing; or permission of instructor.
Cross-listed with WLF F616.
Lecture + Lab + Other: 1 + 0 + 0

BIOL F617  Neurobiology
3 Credits
Offered Spring Even-numbered Years
Organization and function of the vertebrate nervous system from the subcellular to organismal levels. Neural bases of sensations, specific behaviors and homeostasis. Applications of basic neurobiological research to pathological conditions. Examples taken mostly from the recent vertebrate literature.
Prerequisites: BIOL F310; graduate standing; or permission of instructor.
Stacked with BIOL F417.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F618  Biogeography
3 Credits
Offered Fall
This course explores the geography of life by examining linkages between climate, geomorphology, and ecological communities with emphasis on the biogeography of sub-Arctic, polar and alpine regions.
Prerequisites: Graduate standing; or permission of instructor.
Cross-listed with GEOG F618.
Stacked with BIOL F418; GEOG F418.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F628  Advanced Immunology
3 Credits
Offered Spring Even-numbered Years
Advanced level of knowledge and understanding of the structural and molecular basis of the innate and adaptive immune responses in terms of a complex system.
Prerequisites: BIOL F465; BIOL F261 or F360 or equivalent; or permission of instructor.
Cross-listed with CHEM F628.
Lecture + Lab + Other: 3 + 0 + 0
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL F632</td>
<td>Veterinary Bacteriology and Mycology</td>
<td>3</td>
<td>Successful completion of first semester veterinary courses; or permission of instructor.</td>
</tr>
<tr>
<td>BIOL F633</td>
<td>Conservation Genetics</td>
<td>4</td>
<td>Offered Spring. Concepts of population genetics, phylogenetics, pedigree analysis, systematics and taxonomy as they apply to conservation of species. Evaluating the impact of small population size, population fragmentation, inbreeding, hybridization, taxonomic uncertainties and other factors on viability and management of species.</td>
</tr>
<tr>
<td>BIOL F634</td>
<td>Veterinary Parasitology</td>
<td>2</td>
<td>Offered Spring. Biology of helminth, arthropod and protozoan pathogens of animals with emphasis on common infectious diseases encountered in veterinary practice will be discussed. In addition, the course will discuss treatment and management options for parasitic infections of domestic animals.</td>
</tr>
<tr>
<td>BIOL F635</td>
<td>Introduction to Biology of Cancer</td>
<td>3</td>
<td>Cross-listed with DVM F637; MSL F637. Lecture + Lab + Other: 3 + 0 + 0</td>
</tr>
<tr>
<td>BIOL F639</td>
<td>Veterinary Virology</td>
<td>2</td>
<td>Cross-listed with DVM F639; MSL F639. Lecture + Lab + Other: 2 + 0 + 0</td>
</tr>
<tr>
<td>BIOL F640</td>
<td>Veterinary Pathology/Biology of Disease I</td>
<td>5</td>
<td>Offered Spring. This course will discuss basic principles of disease with special emphasis on processes likely to be encountered veterinary practice. We will discuss these topics organized by underlying disease mechanism. The discussions will move from general cell mediated processes to more specific disease mechanisms.</td>
</tr>
<tr>
<td>BIOL F644</td>
<td>Advanced Topics in Evolution</td>
<td>3</td>
<td>Offered Spring Even-numbered Years. Modern theory and subdisciplinary directions in the expanding field of evolutionary biology. Topics include adaptation, speciation, reinforcement, comparative method, group selection, phylogeography, advanced systematics, geographic variation and the role of evolutionary biology in society. May be repeated for credit when content varies.</td>
</tr>
<tr>
<td>BIOL F647</td>
<td>Global to Local Sustainability</td>
<td>3</td>
<td>Cross-listed with ANTH F647; ECON F647; NRM F647. Lecture + Lab + Other: 3 + 0 + 0</td>
</tr>
<tr>
<td>BIOL F649</td>
<td>Integrated Assessment and Adaptive Management</td>
<td>3</td>
<td>Offered Spring. Interdisciplinary exploration of the theoretical and practical considerations of integrated assessment and adaptive management. Students survey concepts important in understanding societal and professional-level decision-making. Students work as individuals and as a team to undertake case studies with relevance to integrated assessment and adaptive management. The class builds a portfolio of cases and conducts an integrated assessment. The course is designed to fit into the sequence of Resilience and Adaptation Program's core courses. It is open to other graduate students interested in and prepared to conduct interdisciplinary studies relating to sustainability. Note: In case of enrollment limit, priority will be given to graduate students in the Resilience and Adaptation Program in order for them to be able to meet their core requirements.</td>
</tr>
</tbody>
</table>

**Recommended Courses:**
- ANTH F647; ECON F647; NRM F647
- ANTH/BIOL/ECON/NRM F647; ANTH/BIOL/ECON/ NRM F667
- ANTH F649; ECON F649; NRM F649

**Cross-listed Courses:**
- ANTH/BIOL/ECON/NRM F647; ANTH/BIOL/ECON/ NRM F667
- ANTH F649; ECON F649; NRM F649
BIOL F656  Environmental Toxicology
3 Credits
Offered Fall Even-numbered Years
Environmental toxicology will focus on the general properties and principles of persistent and/or poisonous (toxic) chemicals commonly encountered in air, water, fish and wildlife. Numerous natural and synthetic chemicals in the environment will be discussed from a global perspective with some bias towards Arctic and sub-Arctic regions.
Prerequisites: CHEM F451; BIOL F303; or one semester each of organic chemistry and cell or molecular biology; or permission of instructor.
Cross-listed with CHEM F655.
Stacked with BIOL F455; CHEM F455.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F657  Environmental Microbiology
3 Credits
Offered Spring Even-numbered Years
This course focuses on the role of microorganisms in environmentally-relevant processes including bioremediation of pollutants, biogeochemical cycling, corrosion and wastewater treatment, including current methods for studying microbial diversity and function.Stacked with BIOL F457.
Prerequisites: BIOL F115X; BIOL F116X; BIOL F342; CHEM F105X; CHEM F106X or equivalent; or permission of instructor.
Recommended: CHEM F451 or BIOL F303 or equivalent.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F660  Principles of Virology
3 Credits
Offered Spring
This course will explore current concepts in the field of virology, with emphasis on the structure, genetic material, and replication strategies of various human and animal viruses. In addition, mechanisms of viral pathogenesis, viral diagnostics, prevention and treatment of viral infection will be presented.
Prerequisites: Graduate standing; or permission of instructor.
Stacked with BIOL F460.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F662  Concepts of Infectious Disease
3 Credits
Offered Spring Odd-numbered Years
Covers infectious disease biology using examples of different pathogens and exploring the concepts of their biology and the implication of these principles on pathology, epidemiology and sociology of infectious diseases.
Prerequisites: Graduate standing; BIOL F261 or BIOL F342; or permission of instructor.
Stacked with BIOL F462.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F665  Aquatic Entomology
2 Credits
Offered Fall Odd-numbered Years
Aquatic invertebrate taxonomy, mostly to the family level, and ecology. Includes field trips to learn collecting techniques and habitats. Students must be able to safely wade in streams and wetlands.
Prerequisites: Graduate standing; or permission of instructor.
Cross-listed with FISH F665.
Lecture + Lab + Other: 1 + 3 + 0

BIOL F667  Resilience Seminar I
1 Credit
Offered Fall
Provides a forum for new students of the Resilience and Adaptation graduate program to explore issues of interdisciplinary research that are relevant to sustainability. A considerable portion of the seminar is student-directed, with students assuming leadership in planning seminar activities with the instructor.
Prerequisites: Student must be enrolled in Resilience and Adaptation graduate program; or permission of instructor.
Recommended: ANTH/BIOL/ECON/NRM F647 (taken concurrently).
Cross-listed with ANTH F667; ECON F667; NRM F667.
Lecture + Lab + Other: 2 + 0 + 0

BIOL F668  Resilience Seminar II
1 Credit
Offered Spring
Provides a forum for new students of the Resilience and Adaptation graduate program to explore issues of interdisciplinary research that are relevant to sustainability. The seminar provides support to each student planning his/her summer internship and preparing and presenting a thesis research prospectus.
Prerequisites: ANTH/BIOL/ECON/NRM F647; ANTH/BIOL/ECON/NRM F667; or permission of instructor.
Cross-listed with ANTH F668; ECON F668; NRM F668.
Lecture + Lab + Other: 2 + 0 + 0

BIOL F669  Landscape Ecology and Wildlife Habitat
3 Credits
Offered As Demand Warrants
A problem based learning and critical thinking approach to modern methods in landscape ecology, including geographic information systems, remote sensing, modeling, software and the Internet. Graduate students are expected to help undergraduates with occurring problems and questions.
Prerequisites: Graduate standing.
Cross-listed with WLF F669.
Stacked with BIOL F469; WLF F469.
Lecture + Lab + Other: 2 + 3 + 0

BIOL F672  Ecosystem Processes
3 Credits
Offered Fall Odd-numbered Years
A comparative approach to the structural and functional components of terrestrial ecosystems, emphasizing primary and secondary production and the dynamics of nutrient cycling processes. Interactions between producers, consumers and decomposition processes, and effects on the efficiencies of nutrient and energy transfers.
Prerequisites: Graduate standing; or permission of instructor.
Lecture + Lab + Other: 2 + 2 + 0

BIOL F675  Plant Physiological Ecology
3 Credits
Offered Fall Even-numbered Years
Physiological ecology of dormancy, germination, growth, photosynthesis, water relations and nutrition with an emphasis on northern and other stressful environments; relationship to community and ecosystem processes.
Prerequisites: Graduate standing; BIOL F239; BIOL F334; BIOL F474; or permission of instructor.
Lecture + Lab + Other: 2 + 3 + 0
Biology (BIOL)

BIOL F679  Cellular and Molecular Neuroscience  
3 Credits  
Offered Fall Even-numbered Years  
The goal of this course is to provide an overview of the cellular and molecular underpinnings of signaling in the nervous system. Discussions will be focused on properties of excitable membranes, synaptic transmission, and neurological integration. Fundamentals of the functional properties of neurons will provide the background for discussions of small neuronal circuits that regulate behavior, the cellular/molecular basis of learning and memory, and pharmacological approaches for the treatment of neuronal pathologies.  
Prerequisites: Two F300-level courses in BIOL or CHEM; MATH F251X or MATH F230X; or permission of instructor.  
Recommended: MATH F252X.  
Cross-listed with CHEM F670.  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F680  Data Analysis in Biology  
3 Credits  
Offered Fall  
Biological applications of nonparametric statistics, including tests based on binomial and Poisson distributions, analysis of two-way and multway contingency tables, and tests based on ranks; multivariate statistics, including principal component analysis, oridination techniques, cluster analysis, and discriminant analysis; and time-series analysis. Introduction to the use of the computer and use of statistical packages. Each student will analyze a data set appropriate to the student's research interests.  
Prerequisites: STAT F200X; STAT F401; either graduate standing in a biologically oriented field; or permission of instructor.  
Cross-listed with WLF F680.  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F681  Principles of Evolution  
4 Credits  
Patterns and processes of evolutionary change are used to explore the unifying principles of the biological sciences. Basic models of population genetics, quantitative genetics, development, phylogenetics and systematics are used to build a conceptual framework for study of living systems.  
Prerequisites: Graduate standing with courses in genetics, ecology and statistics; or permission of instructor.  
Stacked with BIOL F481.  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F686  Vertebrate Paleontology  
3 Credits  
Offered Spring Odd-numbered Years  
The study of vertebrate evolution through geologic time. Covers the temporal range, diversity and systematics of major vertebrate groups as documented in the fossil record, with an emphasis on current problems in vertebrate evolutionary pattern and process. Labs emphasize comparative morphology and identification of major vertebrate groups.  
Prerequisites: Graduate standing; or permission of instructor.  
Cross-listed with BIOL F486; GEOS F486.  
Stacked with GEOS F686.  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F687  Conceptual Issues in Evolutionary Biology  
3 Credits  
Offered Spring Odd-numbered Years  
Analysis of some of the main models which explain evolutionary change followed by consideration of the practical implications these models have on the study of biological phenomena in general.  
Cross-listed with PHIL F687.  
Stacked with BIOL F487; PHIL F487.  
Lecture + Lab + Other: 3 + 0 + 0

BIOL F688  Arctic Vegetation Ecology: Geobotany  
3 Credits  
Offered Spring Even-numbered Years  
Arctic plants in relationship to Earth, including Arctic plant identification, climate, geology and geography controls on Arctic plant communities, snow ecology, applications to wildlife studies and current Arctic issues. Consists of lecture, labs and 1 winter field trip.  
Prerequisites: BIOL F115X and BIOL F116X or equivalent; BIOL F239 or BIOL F371; or permission of instructor.  
Stacked with BIOL F488.  
Lecture + Lab + Other: 3 + 1 + 0

BIOL F689  Vegetation Description and Analysis  
3 Credits  
Offered Fall Even-numbered Years  
Methods of vegetation science including sampling, classification, gradient analysis, ordination, field description and mapping. Field trips to the plant communities of interior Alaska.  
Prerequisites: BIOL F239 or BIOL F233 or BIOL F371 or BIOL F331; or permission of instructor.  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F692  Seminar  
1-6 Credits  
Lecture + Lab + Other: 0 + 0 + 0

BIOL F692P  Seminar  
1-6 Credits  
Lecture + Lab + Other: 0 + 0 + 0

BIOL F695  Special Topics  
1-6 Credits  
Lecture + Lab + Other: 1-6 + 0 + 0

BIOL F698  Non-Thesis Research/Project  
1-12 Credits  
Lecture + Lab + Other: 0 + 0 + 0

BIOL F699  Thesis  
1-12 Credits  
Lecture + Lab + Other: 0 + 0 + 0