BIOLOGY (BIOL)

BIOL F100X  Human Biology  (n)  
4 Credits  
Offered Fall and Spring  
Survey of biological principles as applied to human anatomy, physiology, genetics and health.  
Prerequisites: Placement in WRTG F111X; placement in MATH F105.  
Special Notes: Intended for non-science majors.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F103L  Biology and Society Laboratory  1 Credit  
Offered Fall and 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.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 0 + 3 + 0

BIOL F103X  Biology and Society  (n)  
4 Credits  
Offered Fall and Spring  
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; placement in MATH F105.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F104L  BIOL F104X Laboratory  (n, a)  
0 Credit  
Co-requisites: BIOL F104X.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 0 + 0 + 0

BIOL F104X  Natural History of Alaska  (n, a)  
4 Credits  
Offered Fall  
Survey of the physical and biological environment of Alaska, including terrestrial and aquatic systems. Topics include the past, present, and future climate of Alaska, life histories of common plants and animals, adaptations of organisms to the northern environment, human influences on ecosystems, and the management of wildlife and ecosystems.  
Prerequisites: Placement in WRTG F111X; placement in MATH F105.  
Co-requisites: BIOL F104L.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F111X  Human Anatomy and Physiology I  (n)  
4 Credits  
Offered Fall  
Integrated view of human structure and function. Provides a foundation in relevant chemistry, cell biology, histology and unifying concepts. Covers integumentary, skeletal, muscular and nervous systems.  
Prerequisites: Placement in WRTG F111X; placement in MATH F105.  
Co-requisites: BIOL F111L.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F112X  Human Anatomy and Physiology II  (n)  
4 Credits  
Offered Spring  
Integrated view of human structure and function. Continuation of Human A&P I. Covers endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary and reproductive systems.  
Prerequisites: BIOL F111X.  
Co-requisites: BIOL F112L.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F115X  Fundamentals of Biology I  (n)  
4 Credits  
Offered Fall and Spring  
The first of a two-part course series for science majors, Fundamentals of Biology I covers the chemistry of life, cell structure and function, cellular energetics, cell division, genetics, and evolution.  
Prerequisites: Placement in WRTG F111X; placement in MATH F151X; CHEM F105X (course may be taken concurrently).  
Co-requisites: BIOL F115L.  
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 Fall and Spring  
The second of a two-part course series for science majors, Fundamentals of Biology II covers speciation, organismal diversity, form and function of plants and animals, and ecology.  
Prerequisites: Placement in WRTG F111X; placement in MATH F151X; CHEM F105X (may be taken concurrently); BIOL F115X.  
Co-requisites: BIOL F116L.  
Attributes: UAF GER Natural Science Req  
Lecture + Lab + Other: 3 + 3 + 0

BIOL F120L  BIOL F120X Laboratory  0 Credit  
Co-requisites: BIOL F120X.  
Lecture + Lab + Other: 0 + 0 + 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; placement in MATH F105.  
**Co-requisites:** BIOL F120L.  
**Attributes:** UAF GER Natural Science Req  
**Lecture + Lab + Other:** 3 + 3 + 0  

**BIOL F140**  
**Introduction to Behavioral Neuroscience Research**  
1 Credit  
Offered Spring  
Online asynchronous introductory biomedical research on compulsive-like mice, including data collection, data analysis, and interpretation of results. Learn about obsessive-compulsive disorder in humans and how animal research has the potential to contribute to improving the human condition.  
**Prerequisites:** High school diploma, junior or senior standing in high school with a cumulative and science GPA of at least 3.0 with biology and chemistry course grades of at least 3.0.  
**Lecture + Lab + Other:** 0.5 + 1.5 + 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 Fall and Spring  
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. Available at UAF Community and Technical College.  
**Prerequisites:** One course in high school or college-level biology required.  
**Recommended:** One course in chemistry.  
**Special Notes:** May not be used as biology elective credit for a major or minor in biological sciences.  
**Lecture + Lab + Other:** 3 + 3 + 0  

**BIOL F260**  
**Principles of Genetics**  
4 Credits  
Offered Fall and Spring  
Principles of inheritance; physiochemical properties of genetic systems.  
**Prerequisites:** BIOL F115X; BIOL F116X; CHEM F105X; MATH F151X; LS F101X or successful completion of library skills competency test.  
**Lecture + Lab + Other:** 3 + 3 + 0  

**BIOL F260**  
**Principles of Genetics**  
(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 F310**  
**Animal Physiology**  
(n)  
3 Credits  
Offered Spring  
Animal function, including respiration, digestion, circulation, nerve and muscle function, hormones and reproduction.  
**Prerequisites:** BIOL F115X and BIOL F116X; or BIOL F111X and BIOL F112X.  
**Lecture + Lab + Other:** 3 + 0 + 0  

**BIOL F331**  
**Systematic Botany**  
(n, a)  
3 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.  
**Recommended:** BIOL F260.  
**Lecture + Lab + Other:** 2 + 3 + 0  

**BIOL F335**  
**Principles of Epidemiology**  
(O/2)  
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.  
**Lecture + Lab + Other:** 3 + 0 + 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 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 (may be taken concurrently).  
**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.  
Lecture + Lab + Other: 3 + 0 + 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  Biological Sciences Capstone Project  
0 Credit  
Offered Fall and Spring  
Enrollment in BIOL F400 signals that a student has initiated 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.  
Prerequisites: Junior or senior standing.  
Lecture + Lab + Other: 0 + 0 + 0  

BIOL F401  Fundamentals of Pharmacology  
3 Credits  
Offered Fall Even-numbered Years  
This course emphasizes human and veterinary medical applications for aspiring health practitioners and biomedical scientists. It is an introduction to the science of drugs. Topics include excretion, absorption, movement of drugs throughout the body, receptor-drug binding, signal transduction, dose-response relationships, and associated physiological effects (beneficial and adverse).  
Prerequisites: BIOL F310, BIOL F360, CHEM F360, or CHEM F351.  
Cross-listed with BMSC F401.  
Lecture + Lab + Other: 3 + 0 + 0  

BIOL F402  Biomedical and Research Ethics  
(W, h)  
3 Credits  
Offered Spring Odd-numbered Years  
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, WRTG F212X, WRTG F213X or WRTG F214X; junior or senior standing; a course in philosophy, science, or nursing.  
Cross-listed with PHIL F402.  
Lecture + Lab + Other: 3 + 0 + 0  

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.  
Lecture + Lab + Other: 3 + 3 + 0  

BIOL F412  Exercise Physiology  
3 Credits  
Offered Fall  
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: BIOL F111X and BIOL F112X; or BIOL F310.  
Stacked with BIOL F612.  
Lecture + Lab + Other: 3 + 0 + 0  

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.  
Stacked with BIOL F617.  
Lecture + Lab + Other: 3 + 0 + 0  

BIOL F418  Biogeography  
(a)  
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: NRM F277 or BIOL F371; junior/senior standing.  
Cross-listed with GEOG F418.  
Stacked with BIOL F618; GEOG F618.  
Lecture + Lab + Other: 3 + 0 + 0  

BIOL F425  Mammalogy  
(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.  
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, WRTG F212X, WRTG F213X or WRTG F214X.
**Lecture + Lab + Other:** 2 + 3 + 0

**BIOL F427  Ichthyology**  (n)
4 Credits
Offered Fall and 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 Fall Even-numbered Years
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; BIOL F260.
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**
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 and BIOL F116X; MATH F151X; STAT F200X; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X; senior standing.
**Lecture + Lab + Other:** 3 + 0 + 0

**BIOL F435  Introduction to Biology of Cancer**
3 Credits
Offered Fall Odd-numbered Years
Course covers current concepts and knowledge of cancer, including cancer research and cancer treatment.
**Prerequisites:** BIOL F360.
Stacked with BIOL F635.
**Lecture + Lab + Other:** 3 + 0 + 0

**BIOL F440  Behavioral Neuroscience Research Capstone**
3 Credits
Offered Spring
Online asynchronous comprehensive biomedical research on compulsive-like mice, including data collection, data analysis, and interpretation of results. Learn about obsessive-compulsive disorder in humans and how animal research has the potential to contribute to improving the human condition. Complete the Biology Capstone requirements including writing a full length scientific manuscript.
**Prerequisites:** Junior or senior undergraduate standing.
**Lecture + Lab + Other:** 1 + 6 + 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.
**Prerequisites:** BIOL F481 (may be taken concurrently); BIOL F310; STAT F200X; COJO F131X or COJO F141X; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X.
**Lecture + Lab + Other:** 2 + 2 + 1

**BIOL F455  Environmental Toxicology**  (O)
3 Credits
Offered Fall
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, WRTG F212X, WRTG F213X or WRTG F214X; one semester each of organic chemistry and cell or molecular biology.
Cross-listed with CHEM F455.
Stacked with BIOL F656; CHEM F655.
**Lecture + Lab + Other:** 3 + 0 + 0

**BIOL F457  Environmental Microbiology**  (W)
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.
**Prerequisites:** BIOL F115X; BIOL F116X; BIOL F342; CHEM F105X; CHEM F106X.
Recommended: CHEM F351.
Stacked with BIOL F657.
**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 (may be taken concurrently) or BIOL F360 (may be taken concurrently).

BIOL F462  Infectious Diseases  (O)
3 Credits
Offered As Demand Warrants
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.

BIOL F465  Immunology  (n)
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 F111X and BIOL F112X.

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.
Prerequisites: BIOL F360 or CHEM F360 may be taken concurrently.
Cross-listed with CHEM F466.

BIOL F467  Ecosystems of Alaska  (n)
3 Credits
Offered Summer Even-numbered Years; As Demand Warrants
Focus on the application of ecological principles to field research. Emphasis on the integration of ecology with climatology, geology and hydrology to understand the functioning of ecosystems at local and regional scales. One week of intensive lecture and library research followed by 10 days of field research in the major ecosystems of Alaska.
Prerequisites: An undergraduate course in ecology, geology, hydrology or climatology.

BIOL F469  Landscape Ecology and Wildlife Habitat  (O)
3 Credits
Offered Spring Even-numbered Years
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 problems and questions.
Prerequisites: BIOL F371; COJO F131X or COJO F141X.
Cross-listed with WLF F469.

BIOL F471  Population Ecology  (n)
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.

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, WRTG F212X, WRTG F213X or WRTG F214X.

BIOL F473  Limnology  (W)
3 Credits
Offered Spring
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, WRTG F212X, WRTG F213X or WRTG F214X.

BIOL F476  Ecosystem Ecology  (O, n)
3 Credits
Offered As Demand Warrants
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, WRTG F212X, WRTG F213X or WRTG F214X; COJO F131X or COJO F141X; BIOL F371; STAT F200X.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Offered</th>
<th>Description</th>
<th>Prerequisites</th>
<th>Lecture + Lab + Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL F481</td>
<td>Principles of Evolution</td>
<td>4</td>
<td>Fall and Spring</td>
<td>Patterns and processes of evolutionary change. Covered topics include microevolutionary processes, population genetics, quantitative genetics, fitness and adaptation, phylogenetics, speciation and macroevolutionary pattern. The conceptual framework of evolutionary biology is used to understand basic and applied issues in the life sciences, biomedicine, and agriculture.</td>
<td>Prerequisites: BIOL F260; STAT F200X (may be taken concurrently) or STAT F300 (may be taken concurrently).</td>
<td>3 + 3 + 0</td>
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<tr>
<td>BIOL F483</td>
<td>Stream Ecology</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>The ecology of streams and rivers focusing on physical, chemical and biological processes.</td>
<td>Prerequisites: BIOL F115X; BIOL F116X; BIOL F371. Recommended: CHEM F105X; CHEM F106X.</td>
<td>3 + 0 + 0</td>
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<tr>
<td>BIOL F485</td>
<td>Global Change Biology (W, n, a)</td>
<td>3</td>
<td>Spring</td>
<td>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.</td>
<td>Prerequisites: BIOL F371; CHEM F105X; CHEM F106X; WRTG F111X; WRTG F211X; WRTG F212X; WRTG F213X or WRTG F214X. Cross-listed with WLF F485.</td>
<td>3 + 0 + 0</td>
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<tr>
<td>BIOL F486</td>
<td>Vertebrate Paleontology (n)</td>
<td>3</td>
<td>Odd-numbered</td>
<td>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.</td>
<td>Prerequisites: BIOL F310 or GEOS F315. Cross-listed with GEOS F486. Stacked with GEOS F686; BIOL F686. Lecture + Lab + Other: 2 + 3 + 0</td>
<td>3 + 0 + 0</td>
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<tr>
<td>BIOL F487</td>
<td>Conceptual Issues in Evolutionary Biology</td>
<td>3</td>
<td>Odd-numbered</td>
<td>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.</td>
<td>Cross-listed with PHIL F487. Stacked with BIOL F687; PHIL F687. Lecture + Lab + Other: 3 + 0 + 0</td>
<td>3 + 0 + 0</td>
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<tr>
<td>BIOL F488</td>
<td>Arctic Vegetation Ecology: Geobotany</td>
<td>3</td>
<td>Spring Even-numbered Years</td>
<td>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.</td>
<td>Prerequisites: BIOL F115X and BIOL F116X; BIOL F239 or BIOL F371. Stacked with BIOL F688. Lecture + Lab + Other: 3 + 1 + 0</td>
<td>3 + 1 + 0</td>
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<tr>
<td>BIOL F489</td>
<td>Vegetation Description and Analysis</td>
<td>3</td>
<td>Even-numbered</td>
<td>Methods of vegetation science including sampling, classification, gradient analysis, ordination, field description and mapping. Field trips to the plant communities of interior Alaska.</td>
<td>Prerequisites: BIOL F239, BIOL F371 or BIOL F331. Stacked with BIOL F689. Lecture + Lab + Other: 2 + 3 + 0</td>
<td>2 + 3 + 0</td>
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<tr>
<td>BIOL F490</td>
<td>Research Experience in Biology (W)</td>
<td>3</td>
<td>Spring</td>
<td>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.</td>
<td>Prerequisites: CHEM F105X; CHEM F106X; BIOL F115X; BIOL F116X. Lecture + Lab + Other: 1 + 0 + 6</td>
<td>1 + 0 + 6</td>
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<tr>
<td>BIOL F491</td>
<td>The Human Microbiome</td>
<td>4</td>
<td>Fall</td>
<td>Biology of host-associated microbiomes with an emphasis on the human microbiome. Investigate microbial impacts on the behavior, physiology and fitness of their host. Explore model and non-model systems. Student projects in this course may satisfy the capstone project requirements of the biological science degree.</td>
<td>Prerequisites: BIOL F260 and STAT F200X. Stacked with BIOL F691. Lecture + Lab + Other: 3 + 3 + 0</td>
<td>3 + 3 + 0</td>
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<tr>
<td>BIOL F492</td>
<td>Seminar</td>
<td>1-6</td>
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<td>Lecture + Lab + Other: 0 + 0 + 0</td>
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<td>BIOL F492P</td>
<td>Seminar</td>
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<td>Lecture + Lab + Other: 0 + 0 + 0</td>
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<td>BIOL F498</td>
<td>Research</td>
<td>1-6</td>
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<td>Lecture + Lab + Other: 1-6 + 0 + 0</td>
<td>1-6 + 0 + 0</td>
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</table>
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.
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; permission of instructor.
Cross-listed with WLF F604.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F605 Animal Stable Isotope Ecology
3 Credits
Offered Every Third Spring
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.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F612 Exercise Physiology
3 Credits
Offered Fall
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.
Stacked with BIOL F412.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F613 Resilience Internship
2 Credits
Offered As Demand Warrants
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 autumn students meet to discuss their internship experiences and make public presentations.
Prerequisites: ANTH F667, BIOL F667, ECON F667 or NRM F667; ANTH F668, BIOL F668, ECON F668 or NRM F668.
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.
Stacked with BIOL F415.
Lecture + Lab + Other: 3 + 3 + 0

BIOL F616 Ecological Background for Resilience and Adaptation (a)
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.
Cross-listed with NRM 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 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; graduate standing.
Stacked with BIOL F417.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F618 Biogeography (a)
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.
Cross-listed with GEOG F618.
Stacked with BIOL F418; GEOG F418.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F632 Veterinary Bacteriology and Mycology
2 Credits
Offered Spring
This course will discuss bacterial structure, differences between bacterial families, and fungi and their pathogenesis. The basic principles of bacterial and fungal pathogenesis will be presented. Host response to bacterial or fungal infection, immunity and the role of vaccines in disease prevention will be explained.
Prerequisites: Successful completion of first-semester veterinary courses.
Cross-listed with DVM F637; MSL F637.
Lecture + Lab + Other: 2 + 0 + 0
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Offered</th>
<th>Prerequisites/Recommended</th>
<th>Special Notes</th>
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<tbody>
<tr>
<td>BIOL F633</td>
<td>Conservation Genetics</td>
<td>4</td>
<td>Fall, Even-numbered Years</td>
<td>BIOL F260; BIOL F371</td>
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<td></td>
<td>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>
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<td><strong>Prerequisites:</strong> BIOL F260; BIOL F371.</td>
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<td><strong>Recommended:</strong> NRM F277.</td>
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<td><strong>Cross-listed with</strong> WLF F633.</td>
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<td><strong>Stacked with</strong> BIOL F433; WLF F433.</td>
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<tr>
<td>BIOL F635</td>
<td>Introduction to Biology of Cancer</td>
<td>3</td>
<td>Fall, Odd-numbered Years</td>
<td>BIOL F360.</td>
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<td>Course covers current concepts and knowledge of cancer, including cancer research and cancer treatment.</td>
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<td><strong>Prerequisites:</strong> BIOL F360.</td>
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<td><strong>Stacked with</strong> BIOL F435.</td>
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<tr>
<td>BIOL F639</td>
<td>Veterinary Virology</td>
<td>2</td>
<td>Spring</td>
<td>BIOL F430.</td>
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<td>This course will explore current concepts in the field of veterinary virology, with an emphasis on the viral structure, viral genetic material and viral replication strategies of various animal viruses. In addition, mechanisms of viral pathogenesis, prevention and treatment of viral infection will be presented.</td>
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<td><strong>Prerequisites:</strong> Successful completion of first-semester veterinary courses.</td>
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<td><strong>Cross-listed with</strong> DVM F639; MSL F639.</td>
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<td><strong>Lecture + Lab + Other:</strong> 2 + 0 + 0</td>
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<td>BIOL F640</td>
<td>Veterinary Pathology/Biology of Disease</td>
<td>5</td>
<td>Spring</td>
<td>BIOL F430; BIOL F431</td>
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<td>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>
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<td><strong>Prerequisites:</strong> Successful completion of first-semester veterinary courses.</td>
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<td><strong>Cross-listed with</strong> DVM F639; MSL F639.</td>
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<td><strong>Lecture + Lab + Other:</strong> 4 + 3 + 0</td>
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<td>BIOL F641</td>
<td>Animal Welfare</td>
<td>2</td>
<td>Fall</td>
<td>BIOL F430; BIOL F431</td>
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<td>This course will provide knowledge, skill development and tools necessary for professionals to assess and promote animal welfare and to analyze its associated challenges. It will stress the need for perpetual reassessment of animal welfare knowledge and reinforce the professional's role in staying up-to-date and proactive.</td>
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<td><strong>Prerequisites:</strong> Completion of first year of veterinary school, or graduate student with approval of instructor.</td>
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<td><strong>Cross-listed with</strong> DVM F735.</td>
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<tr>
<td>BIOL F644</td>
<td>Advanced Topics in Evolution</td>
<td>3</td>
<td>Spring, Odd-numbered Years</td>
<td>BIOL F639; MSL F639</td>
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<td>Modern theory and subspecialized 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>
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<td><strong>Prerequisites:</strong> Undergraduate course in evolution.</td>
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<td><strong>Lecture + Lab + Other:</strong> 3 + 0 + 0</td>
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<tr>
<td>BIOL F647</td>
<td>Global to Local Sustainability</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>BIOL F647; MSL F647; ECON F647</td>
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<td>Explores the basic principles that govern resilience and change of ecological and social systems. Principles are applied across a range of scales from local communities to the globe. Working within and across each of these scales, students address the processes that influence ecological, cultural and economic sustainability, with an emphasis on northern examples.</td>
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<td><strong>Prerequisites:</strong> Graduate standing.</td>
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<td><strong>Cross-listed with</strong> ANTH F647; ECON F647; NRM F647.</td>
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<td><strong>Lecture + Lab + Other:</strong> 3 + 0 + 0</td>
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<tr>
<td>BIOL F649</td>
<td>Integrated Assessment and Adaptive Management</td>
<td>3</td>
<td>As Demand Warrants</td>
<td>BIOL F647; MSL F647; ECON F647; ANTH F647</td>
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<td>An 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. Collectively, the class builds a portfolio of cases and conducts an integrated assessment.</td>
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<td><strong>Prerequisites:</strong> Graduate student standing in a natural science, social science or interdisciplinary program at UAF or another university.</td>
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<td><strong>Recommended:</strong> ANTH F647, BIOL F647, ECON F647, NRM F647; ANTH F667, BIOL F667, ECON F667, NRM F667.</td>
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<td><strong>Cross-listed with</strong> ANTH F649; ECON F649; NRM F649.</td>
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<td><strong>Special Notes:</strong> 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>
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<td><strong>Lecture + Lab + Other:</strong> 3 + 0 + 0</td>
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<td>BIOL F656</td>
<td>Environmental Toxicology</td>
<td>3</td>
<td>Fall</td>
<td>BIOL F430; BIOL F431</td>
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<td>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.</td>
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<td><strong>Prerequisites:</strong> CHEM F351; or one semester each of organic chemistry and cell or molecular biology.</td>
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<td><strong>Cross-listed with</strong> CHEM F655.</td>
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<td><strong>Stacked with</strong> BIOL F455; CHEM F455.</td>
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<td><strong>Lecture + Lab + Other:</strong> 3 + 0 + 0</td>
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</table>
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.
Prerequisites: BIOL F115X; BIOL F116X; BIOL F342; CHEM F105X; CHEM F106X.
Recommended: CHEM F351.
Stacked with BIOL F457.
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.
Stacked with BIOL F460.
Lecture + Lab + Other: 3 + 0 + 0

BIOL F662    Infectious Diseases
3 Credits
Offered As Demand Warrants
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 F360 or BIOL F342.
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.
Prerequisites: Graduate standing; Students must be able to safely wade in streams and wetlands.
Cross-listed with FISH F665.
Lecture + Lab + Other: 1 + 3 + 0

BIOL F667    Resilience Seminar I
1 Credit
Offered As Demand Warrants
Provides a forum for new students of the Resilience and Adaptation graduate program to explore issues of interdisciplinary research 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 F647, BIOL F647, ECON F647 or NRM F647; ANTH F667, BIOL F667, ECON F667 or NRM F667.
Cross-listed with ANTH F668; ECON F668; NRM F668.
Lecture + Lab + Other: 2 + 0 + 0

BIOL F668    Resilience Seminar II
1 Credit
Offered As Demand Warrants
Provides a forum for new students of the Resilience and Adaptation graduate program to explore issues of interdisciplinary research relevant to sustainability. The seminar provides support to each student planning his/her summer internship and preparing and presenting a thesis research prospectus.
Prerequisites: Graduate standing.
Cross-listed with WLF F669.
Stacked with BIOL F469; WLF F469.
Lecture + Lab + Other: 2 + 3 + 0

BIOL F669    Landscape Ecology and Wildlife Habitat
3 Credits
Offered Spring Even-numbered Years
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 problems and questions.
Prerequisites: Graduate standing.
Cross-listed with WLF F669.
Lecture + Lab + Other: 2 + 2 + 0

BIOL F672    Ecosystem Processes
3 Credits
Offered As Demand Warrants
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.
Lecture + Lab + Other: 2 + 3 + 0

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.
Recommended: MATH F252X.
Cross-listed with CHEM F670.
Stacked with CHEM F470.
Lecture + Lab + Other: 3 + 0 + 0
BIOL F680  Data Analysis in Biology  
3 Credits  
Offered Spring  
Biological applications of nonparametric statistics, including tests based on binomial and Poisson distributions, analysis of two-way and multiway contingency tables, and tests based on ranks; multivariate statistics, including principal component analysis, ordination techniques, cluster and discriminate 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; graduate standing in a biologically oriented field.  
Cross-listed with WLF F680.  
Lecture + Lab + Other: 2 + 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.  
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; BIOL F239 or BIOL F371.  
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, BIOL F371 or BIOL F331.  
Stacked with BIOL F489.  
Lecture + Lab + Other: 2 + 3 + 0

BIOL F691  The Human Microbiome  
4 Credits  
Offered Fall  
Biology of host-associated microbiomes with an emphasis on the human microbiome. Investigate microbial impacts on the behavior, physiology and fitness of their host. Explore model and non-model systems. Student projects in this course may satisfy the capstone project requirements of the biological science degree.  
Prerequisites: BIOL F260 or STAT F200X.  
Stacked with BIOL F491.  
Lecture + Lab + Other: 3 + 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 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