

## **BIOL S101 Introduction to Biological Research Techniques I**

*Upon successful completion of this course, students will be able to:*

1. Develop a research plan including hypothesis, controls and procedures.
2. Conduct a primary literature review relating to their research project.
3. Use lab and/or field techniques appropriate to the procedure.
4. Collect and process field samples as well as environmental data relevant to their research plan.
5. Appropriately document protocols & data collection.

## **BIOL S102 Introduction to Biological Research Techniques II**

*Upon successful completion of this course, students will be able to:*

1. Write their research findings formatted as a scientific manuscript, including abstract, introduction, materials and methods, results and discussion.
2. Focus on analyzing their already-collected data using appropriate techniques.
3. Share their research as a poster and/or oral presentation to the public at a workshop, conference or symposium.
4. Review the scientific literature and, using critical thinking skills, formulate a discussion based upon their analysis and results for their research project.

## **BIOL S103 Biology and Society**

*Upon successful completion of this course, students will be able to:*

1. Explain the basic principles and concepts behind scientific method, cell structure, biological energy transformation, the structure of DNA, cell reproduction, patterns of inheritance, evolution, and ecology.

## **BIOL S104 Natural History of Alaska**

*Upon successful completion of this course students will be able to:*

1. Explain the process of scientific observation and investigation and the role it plays in our knowledge and appreciation of the environment.
2. Explain how meteorological, geological and biological forces have shaped Alaska's ecosystems and topography.
3. Explain the relationship between geologic and biological history using a selection of Alaskan organisms.
4. Use taxonomic keys, written descriptions and range maps to identify organisms.

## **BIOL S105 Fundamentals of Biology I**

*Upon successful completion of this course, students will be able to:*

1. Explain the basic chemistry of life.
2. Describe the basic structure and function of cells.
3. Summarize the transmission and evolution of heritable information.

4. List the major components of the scientific method.
5. Write the components of a scientific paper in the proper format.

### **BIOL S106 Fundamentals of Biology II**

*Upon successful completion of this course, students will be able to:*

1. Explain hypotheses for the origin of life on earth.
2. Describe the major groups of animals, plants, fungi, and protists.
3. Describe the concept of homeostasis and several examples of its function.
4. Summarize the basics of reproduction and development in plants and animals.
5. Describe the basics of the immune system in animals.
6. Summarize the levels of ecological organization important to life on earth.

### **BIOL S107 Flora of Southeastern Alaska**

*Upon successful completion of this course, students will be able to:*

1. Describe the morphology of vegetative and reproductive characteristics of local plants.
2. Identify all of the common native tree and shrub species as well as the most common herbaceous species occurring in southeastern Alaska.
3. Utilize dichotomous and multi-access keys to identify unknown plant species.
4. Identify and recognize the common plant families found in southeastern Alaska.
5. Describe the roles of plants in the local ecosystem.

### **BIOL S110 Introduction to Marine Fisheries Science**

*Upon successful completion of this course, students will be able to:*

1. Understand the primary role of natural selection in driving adaptation in fish.
2. Apply concepts of population growth and density-dependence to explain patterns in abundance.
3. Clearly articulate the logic behind how Alaska salmon fisheries are managed (e.g. what's fixed escapement?)
4. Articulate some of the frequently used definitions of sustainability and resilience and clearly explain what these terms mean to you.
5. Understand what is meant by global climate change and explain some of the challenges it poses for fisheries management. Explain how climate is different than weather.
6. Understand that the environment affect the carrying capacity for most fishery species.
7. See connections between different topics and ideas and apply these connections to new scenarios.

## **BIOL S111 Human Anatomy and Physiology I**

*With respect to development of foundational knowledge in terminology, chemistry, cells, and tissues, and with respect to focused study of integumentary, skeletal, muscular and nervous systems, and upon successful completion of this course, students will be able to:*

1. Develop a vocabulary of appropriate terminology to effectively communicate information related to anatomy and physiology.
2. Recognize the anatomical structures and explain the physiological functions of body systems.
3. Recognize and explain the principle of homeostasis and the use of feedback loops to control physiological systems in the human body.
4. Use anatomical knowledge to predict physiological consequences, and use knowledge of function to predict the features of anatomical structures.
5. Recognize and explain the interrelationships within and between anatomical and physiological systems of the human body.
6. Synthesize ideas to make a connection between knowledge of anatomy and physiology and real-world situations, including healthy lifestyle decisions and homeostatic imbalances.
7. Demonstrate laboratory procedures used to examine anatomical structures and evaluate physiological functions of each organ system.
8. Interpret graphs of anatomical and physiological data.
9. Demonstrate information literacy skills to access, evaluate, and use resources to stay current in the fields of anatomy and physiology.
10. Approach and examine issues related to anatomy and physiology from an evidence-based perspective.
11. Communicate clearly and in a way that reflects knowledge and understanding of the human body and demonstrates the ability to adapt information to different audiences and applications.

## **BIOL S112 Human Anatomy and Physiology II**

*With respect to focused study of endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems, and upon successful completion of this course, students will be able to:*

1. Develop a vocabulary of appropriate terminology to effectively communicate information related to anatomy and physiology.
2. Recognize the anatomical structures and explain the physiological functions of body systems.
3. Recognize and explain the principle of homeostasis and the use of feedback loops to control physiological systems in the human body.

4. Use anatomical knowledge to predict physiological consequences, and use knowledge of function to predict the features of anatomical structures.
5. Recognize and explain the interrelationships within and between anatomical and physiological systems of the human body.
6. Synthesize ideas to make a connection between knowledge of anatomy and physiology and real-world situations, including healthy lifestyle decisions and homeostatic imbalances.
7. Demonstrate laboratory procedures used to examine anatomical structures and evaluate physiological functions of each organ system.
8. Interpret graphs of anatomical and physiological data.
9. Demonstrate information literacy skills to access, evaluate, and use resources to stay current in the fields of anatomy and physiology.
10. Approach and examine issues related to anatomy and physiology from an evidence-based perspective.
11. Communicate clearly and in a way that reflects knowledge and understanding of the human body and demonstrates the ability to adapt information to different audiences and applications.

### **BIOL S175 Current Topics of Marine Research (Submitted by Jan Straley 3/16)**

*Upon successful completion of this course, students will be able to:*

1. Read and analyze research papers and discuss research methods.
2. Compare and contrast research projects discussing similarities and differences.
3. Demonstrate knowledge or presented research by writing a synthesis paper on speakers analyzed.

### **BIOL S215 Introduction to Marine Biology**

*Upon successful completion of this course, students will be able to:*

1. Describe how physical aspects of the marine environment shape the general biology of marine organisms.
2. Summarize the basic phyletic taxonomic diversity of marine organisms.
3. Identify the basic habitat types found in the ocean and their general physical and biological characteristics.
4. Explain the degree of ecological connectivity among basic ocean habitats.
5. List the major human threats to marine habitats and stability.

### **BIOL S239 Introduction to Plant Biology**

*Upon successful completion of this course, students will be able to:*

1. Describe basic plant physiology and processes such as photosynthesis, cell respiration, growth and development.
2. Summarize major trends in the evolutionary history of plants.
3. List the major tissue systems of plants and how they develop.
4. Define common plant morphology terminology used in identification of taxa.
5. List the discriminating characteristics of the major botanical taxa.
6. Summarize the many ecological niches and diverse strategies employed by plants to thrive across the globe.

### **BIOL S240 Introductory Microbiology**

*Upon successful completion of this course, students will be able to:*

1. Explain fundamental principles of microbial anatomy, physiology and genetics and how these principles determine a microbe's function, habitat and ability to cause disease in humans or developing resistance to antimicrobials.
2. Describe tactics microbes use to establish disease in humans.
3. Summarize defenses of the human immune system and how those defenses work together to keep microbes at bay.
4. Demonstrate common microbiological techniques to culture and identify bacteria in a manner consistent with all safety guidelines.
5. Describe the unit learning objectives that cover the main principles and techniques illustrated in this course.
6. Extrapolate the academic knowledge gained in this course to the global struggle with microbes.
7. Describe how the foundation of microbial diseases is used in applied research, patient care and other fields of interest.

### **BIOL S271 Ecology**

*Upon successful completion of this course, students will be able to:*

1. Summarize the physical, chemical, and biological features that determine the distributions and abundances of organisms.
2. Describe ecological interactions at the individual organism, population, community, and ecosystem levels.
3. Be able to design, conduct, and complete an ecology research project to demonstrate their quantitative, written, and oral communication skills.

### **BIOL S300 Vertebrate Zoology**

*Upon successful completion of this course, students will be able to:*

1. Define a chordate and a vertebrate.

2. Describe the chronology of major events in vertebrate evolution.
3. Describe the defining characters of each major clade of vertebrates.
4. Describe the specializations of living vertebrate clades.
5. Use the proper taxonomic terminology for the major groups of vertebrates.
6. Describe the comparative anatomy of the major groups of vertebrates.
7. Describe the relationships of fish to tetrapod, birds to dinosaurs and humans to other mammals.

### **BIOL S305 Invertebrate Biology**

*Upon successful completion of this course, students will be able to:*

1. Describe the animal phyla that include the multicellular invertebrate organisms found in marine, estuarine, and terrestrial environments.
2. Describe the morphology, physiology, ecology and evolution of invertebrate animal phyla.

### **BIOL S310 Animal Physiology**

*Upon successful completion of this course, students will be able to:*

1. Describe physiological processes driving animal function from the cellular to the organismal levels.
2. Describe neurological, metabolic, endocrine, osmoregulatory, respirator, and circulatory processes.
3. Describe the differences in physiological structures of vertebrates and invertebrates.
4. Articulate the physiological mechanisms that adapt an organism to a particular environment.

### **BIOL S311 Communicating Science**

*Upon successful completion of this course, students will be able to:*

1. Collect, analyze, document, and report research clearly, concisely, logically, and ethically.
2. Explain standards for legitimate interpretations of research data within scientific and technical communities.
3. Prepare practical documents for presentation to a variety of professional audiences (including peers and colleagues, or management) and public audiences.
4. Demonstrate writing and speaking skills that model effective scientific and technical communication in the workplace.

### **BIOL S353 Tropical Marine and Coastal Ecology**

*Upon successful completion of this course, students will be able to:*

1. Explain the biodiversity, habitat connectedness, and natural and anthropogenic impacts of tropical marine and coastal ecosystems, and how these ecosystems are managed and conserved.
2. Explain the purpose, methods, results, and conclusions of studies presented in the scientific literature.
3. Demonstrate the ability to communicate one's personal perspectives and views on written and spoken material while considering other, alternative points of view.
4. Write the components of a scientific paper in the proper format.
5. Demonstrate the ability to verbally discuss scientific concepts, ideas, and opinions.
6. Demonstrate mastery of marine biology field techniques and skills.

### **BIOL S355 Experimental Design and Data Analysis**

*Upon successful completion of this course, students will be able to:*

1. Describe basic tenets of effective sampling design.
2. Perform basic statistical analyses using: t-tests, ANOVA, regression, ANCOVA, and chi-squared tests.
3. Formulate hypothetical sampling and experimental designs given a research question.
4. Demonstrate effective conduct of experimental design and analysis of an independent research topic.
5. Interpret research results from the primary literature that involve basic statistics including: t-tests, ANOVA, regression, ANCOVA, and chi-squared analyses.
6. Identify best practices in making data graphs, giving talks, scientific writing, and the use of animals of research.

### **BIOL S362 Genetics**

*Upon successful completion of this course, students will be able to:*

1. Demonstrate mastery of the processes of DNA replication, transcription, and translation.
2. Describe the principles of inheritance at the molecular, cellular, and organismal levels.
3. Interpret data from Mendelian crosses and explain Mendelian and non-Mendelian inheritance.
4. Evaluate population genetic and quantitative genetic data to infer evolutionary processes.

### **BIOL S373 Conservation Biology**

*Upon successful completion of this course, students will be able to:*

1. Articulate what biological diversity is and what affects it.
2. Describe the social and legal context for conservation activities.
3. Evaluate factors that contribute to population growth and dynamics.
4. Construct a framework for evaluating factors that threaten imperiled populations, species, and ecosystems.

### **BIOL S375 Current Topics in Biology**

*Upon successful completion of this course, students will be able to:*

1. Facilitate and participate in discussions of cutting-edge biology topics.
2. Summarize scientific papers describing cutting-edge biology topics.

### **BIOL S380 Marine Ornithology and Herpetology**

*Upon successful completion of this course, students will be able to:*

1. Describe the biology, ecology, and conservation of marine birds and sea turtles with an emphasis on the adaptive strategies that have evolved to overcome the challenges of living in a marine environment.
2. Evaluate views on written and spoken material while considering other, alternative points of view.
3. Communicate complex scientific concepts clearly and effectively by reading and discussing peer-reviewed literature and writing a research paper.
4. Demonstrate professionalism through punctuality, responsibility, accountability, and respect for others.

### **BIOL S384 Marine Mammalogy**

*Upon successful completion of this course, students will be able to:*

1. Understand and describe the biology, ecology, and conservation of marine mammals with an emphasis on the adaptive strategies that have evolved to overcome the challenges of living in a marine environment.
2. Evaluate and challenge views on written and spoken material while considering other, alternative points of view.
3. Communicate complex scientific concepts clearly and effectively by reading and discussing peer-reviewed literature and writing a research paper.
4. Demonstrate professionalism through punctuality, responsibility, accountability, and respect for others.

### **BIOL S396 Field Studies in Behavior and Ecology**

*Upon successful completion of this course, students will be able to:*

1. Conduct literature searches for topics of interest.
2. Critically examine scientific papers.
3. Use insights from scientific papers to develop a testable hypothesis.
4. Conduct a rigorous field study of an ecological phenomenon.
5. Communicate research results in discussions, oral presentations, and written reports.

## **BIOL S401 Phycology**

*Upon successful completion of this course, students will be able to:*

1. Use taxonomic keys to identify species of macroalgae.
2. Identify the common seaweeds in the Juneau area.
3. Describe the life histories of various algae in the Rhodophyceae, Phaeophyceae, and Chlorophyta.
4. Demonstrate the proper use of a compound and a stereo microscope.
5. Make cross sections of algae for microscopic identification of cellular structures.
6. Describe the basic physiological concepts of algae.
7. Demonstrate how to collect press and label macrophytes.
8. Describe the use and care of phycological herbarium specimens.
9. Provide the definitions of phycological terms and their biological implications.
10. Describe the basic biology and ecology of all classes of algae including the Cyanophyceae.
11. Identify to genus phytoplankton in the Juneau area.
12. Collect phytoplankton in the field.
13. Read tide tables for planning collection trips to the intertidal.
14. Draw correct inferences from physiological and ecological experiments.
15. Design a simple phycological experiment for field or lab study.
16. Find relevant phycological information using library and on-line resources.
17. Prepare and deliver a scientific exposition on various topics in phycology.
18. Explain the interactions of algae and people.
19. Describe basic concepts of the mariculture of seaweeds.
20. List commercial uses for seaweeds.
21. Compare and contrast similar looking or sounding phycological terms.
22. Identify issues associated with the interaction of aquatic pollution and algae.

## **BIOL S410 Physiology of Marine Animals**

*Upon successful completion of this course, students will be able to:*

1. Describe how marine animals physiologically adapt to changes in environmental salinity, oxygen, temperature, and nutrients.
2. Describe how diving mammals including whales, seals, and penguins adapt to their marine environment.
3. Demonstrate an understanding of special adaptations of marine animals in extreme environments.
4. Read and discuss primary scientific literature.
5. Communicate scientific ideas in a formal oral presentation.

## **BIOL S427 Introduction to Ichthyology**

*Upon successful completion of this course, students will be able to:*

1. Describe how aquatic environments shape fundamentals of physiology, anatomy, locomotion, and behavior of fishes.
2. List and define the major taxonomic groupings of living fish groups, and explain broad anatomical trends in their evolution.
3. Explain the basic strategies used by fish for gas exchange, homeostasis, sensory perception, and reproduction.
4. Summarize historical and current threats to fish diversity from fishing, pollution, habitat modification and climate change.
5. Interpret and lead discussions of the primary literature in fish biology.

## **BIOL S441 Animal Behavior**

*Upon successful completion of this course, students will be able to:*

1. Explain the difference between proximate and ultimate studies of behavior, and be able to identify examples of each.
2. Describe the genetic, developmental, and neurological basis of animal behavior.
3. Explain optimization theory and the role it plays in the evolutionary of behavior.
4. Interpret variation in mate choice, food acquisition, competition, parental care, and altruism in the context of its evolutionary significance.
5. Interpret and lead discussions of published research on a range of animal behaviors.
6. Perform basic laboratory demonstrations of behaviors using live invertebrate animals.

## **BIOL S480 Aquatic Pollution**

*Upon successful completion of this course, students will be able to:*

1. List various classes of pollutants and their biological and ecological effects.
2. Describe historically significant pollution events in the world such as mercury in Minamata, oil tanker spills, DDT in the USA etc.
3. Critically evaluate the evidence for global climate change and the consequences for dealing or not dealing with it.
4. Explain how to calculate EC50's, LOELs and other measures of toxicity.
5. Determine how to calculate risks associated with various contaminants.
6. Describe the difference between a contaminant and a pollutant.
7. Explain the significant aspects of various water pollution treaties such as MARPOL.
8. Explain how politics and special interests color conversations about aquatic pollution.
9. Find scientific information on the causes and effects of any aquatic contaminant.
10. Prepare and present to the public a water pollution issue.
11. Critically evaluate evidence for the causes and effects of any aquatic contaminant.
12. Find and report information on current events in the field of aquatic pollution.

### **BIOL S481 Marine Ecology**

*Upon successful completion of this course, students will be able to:*

1. Describe how marine aquatic environments shape fundamentals of physiology, anatomy locomotion, and behavior of marine organisms.
2. Describe the major biological contributors to marine primary productivity.
3. Contrast physical and biological characteristics of the following major marine habitats: rocky intertidal, soft intertidal, sub-tidal, open water, and polar.
4. Compare and contrast the relative impacts of predation, grazing, parasitism and mutualism on marine communities.
5. Explain the basic strategies of larval settlement and recruitment.
6. Summarize the roles that disturbance and facilitation play in the community structure of marine habitats.

### **BIOL S482 Evolution**

*Upon successful completion of this course, students will be able to:*

1. Describe Darwin's theory of evolution by natural selection.
2. Predict how evolutionary forces cause populations to change over space and time.
3. Explain how evolution has led to the unity and diversity of existing life forms.
4. Synthesize and present scientific information in written, poster, and oral formats.

### **BIOL S492 Biology Seminar**

*Upon successful completion of this course, students will be able to:*

1. Summarize oral scientific presentations by identifying key components of research, including experimental design, statistical analysis, and interpretation of results.
2. Interact with professional biologists by asking questions about their research and discussing results from oral scientific presentations.

### **BIOL S498 Research in Biology**

*Upon successful completion of this course, students will be able to:*

1. Develop and test hypotheses to explain biological phenomena with input from a faculty mentor.
2. Complete a research project with a formal summary presentation in written, poster, or oral format.