



Program Assessment Plan

Bachelor of Arts in Biology University of Alaska Southeast

Program Faculty

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Table of Contents

I. Degree Title	3
II. Student Assessment	3
A. Student Learning Goals and Outcomes	3
B. Student Outcomes	3
C. UAS Competencies	4
III. Relevance to the University Mission	5
IV. Curriculum Map	5
V. Learning Outcomes Assessment Methods and Measures	8
VI. Program Assessment Methods and Measures	9
VII. Assessment Cycle	10
VIII. Curriculum	12
IX. Course Descriptions	13
Appendix A: Course Syllabi	19
Appendix B: Exit Interview Questions	31

I. Degree Title

Bachelor of Arts in Biology, University of Alaska Southeast

II. Student Assessment

A. Student Learning Goals

The Biology faculty have worked together to develop the Bachelor of Arts in Biology curriculum which provides a solid foundation for students in biology with a strong core in general biology and complements our existing Bachelor of Sciences degree in Biology. We developed this program specifically to meet the needs of students who are interested in pursuing a career in teaching and don't require the extent of physical sciences required in the Bachelor of Science degree in Biology. The B.A. in Biology maintains a rigorous curriculum and produces graduates ready to gain employment or pursue teaching careers. This degree does not preclude students from pursuing graduate studies in the field. The B.A. in Biology is designed to serve the needs of three groups of undergraduate students. First, it is directed toward students preparing to enter graduate or professional schools. Graduate schools may include any of a number of foci in the field of biological science (genetics, conservation biology, ecology, physiology). Professional schools may include medical, dental, or optometry. Second, it is designed to serve students seeking entry-level employment in the fields related to biology, including positions at state and federal agencies. Third, it is designed to serve students preparing to enter the M.A.T. program in secondary education at UAS and thus reflects the requirements for certification in science. The B.A. in Biology is designed to capitalize on the unique natural setting and natural resources in Southeast Alaska. Many of the courses involve hands-on field and laboratory exercises. This degree encourages students to increase breadth in areas outside the biological sciences.

Specific learning goals include the following.

1. The graduate will master fundamentals of biological science.
2. The graduate will understand fundamentals of mathematics, statistics, chemistry and physical sciences and how they relate to biological science.
3. The graduate will have an increased breadth of study in academic areas outside of biology.
4. The graduate will master an in-depth study of organismal-level biology.
5. The graduate will master an in-depth study of a core in general biology.

B. Student Outcomes

Specific outcomes for each of these goals include the following. For a more detailed listing of courses and outcomes, see the Biology program curriculum map in Section IV.

Goal 1. The graduate will master fundamentals of biological science through:

1. Understanding and articulation of content areas (i.e.: mechanisms of evolution, chemical processes of life, biological diversity, and genetics) pertaining to Biology
2. Understanding and articulation of the terminology (i.e. DNA transcription, specific taxonomy) specific to Biology
3. Understanding through laboratory exercises contemporary techniques employed in the field (ie: field surveys, electrophoresis, chromatography, and computer modeling)

Goal 2. The graduate will understand fundamentals of mathematics, statistics, chemistry and physical sciences and how they relate to biological science through:

1. Understanding the content areas specific to these disciplines.
2. Integrating the fundamentals of mathematics, statistics, chemistry and physical sciences into higher level program courses

Goal 3. The graduate will master an in-depth study of organismal-level biology.

1. Understanding and articulation of the major principals of ecology
2. Understanding and articulation of the major principals of animal physiology
3. Understanding and articulation of the major principals of genetics
4. Understanding and articulation of the major principals of evolution

Goal 4. The graduate will master an in-depth study of core concepts in general biology

1. Understanding and articulation of taxonomic diversity expressed courses such as vertebrate zoology, ichthyology, marine mammalogy, and phycology
2. Understanding and articulation of the major principals of physiology of marine organisms
3. Understanding and articulation of the major principals of ecology
4. Understanding and articulation of the major principals of animal behavior

C. UAS Competencies

The following competencies will be integrated into the program through achievement of the student learning goals as follows:

	Goal One	Goal Two	Goal Three	Goal Four
Communication Written Oral	X	X	X	X
Quantitative Skills	X	X	X	X
Information Literacy	X		X	X
Computer Literacy	X	X	X	X
Professional Behavior	X	X	X	X
Critical Thinking	X	X	X	X

III. Relevance to the University Mission

The B.A. in Biology supports the university's goal of providing a quality undergraduate program in the biological sciences. Specifically, the B.A. in Biology furthers the following core values of the UAS mission:

- Achieving distinction as a learning community
- Developing programs rooted in its unique natural setting.
- Developing educated citizens with a sense of personal ethics
- Contributing to the economic development of the region and the state through basic and applied research and public service
- Forging dynamic partnerships with other academic institutions, governmental agencies and private industry

IV. Curriculum Map The Biology faculty have worked together and agree that the following goals are introduced (I), developed (D)and mastered (M)at the following points in the program:

A. Map

	BIOL 105	BIOL 106	BIOL 271	BIOL 310	BIOL 362	BIOL 482	
Goal 1.							
Outcome 1.	I	I	D	M	M	M	
Outcome 2.	I	I	D	D	D	M	
Outcome 3.	I	I	D	D	D	M	
Goal 2.							
Outcome 1.	I	I	D	D	D		
Outcome 2.	I	I	D	D	D	M	
Goal 3.							
Outcome 1.			M				
Outcome 2.		M					
Outcome 3.			M	M	M		
Outcome 4.				M	M		
Goal 4.							
Outcome 1.	I	I		D	D	D	
Outcome 2.	I	I	D	D			
Outcome 3.	I	I	D				
	BIOL 305	BIOL 384	BIOL 401	BIOL 415	BIOL 481	BIOL 300	BIOL 239
Goal 1.							
Outcome 1.	D	D	M	M	M	D	I
Outcome 2.	D	D	M	M	M	D	D
Outcome 3.		D	D	M	M		
Goal 2.							

Outcome 1.				M	M		
Outcome 2.				M	M		
Goal 3.							
Outcome 1.	D	D	D	D	D	D	D
Outcome 2.				M			
Outcome 3.							
Outcome 4.	D	D	D			D	D
Goal 4.							
Outcome 1.	M		M				
Outcome 2.		M					
Outcome 3.							

	BIOL 375	BIOL 396	BIOL 426	BIOL 427	BIOL 441	BIOL 480	BIOL 492
Goal 1.							
Outcome 1.	D	D	D	D	D	D	
Outcome 2.	D	D	M	D	M	M	D
Outcome 3.		M	M				
Goal 2.							
Outcome 1.		D				D	D
Outcome 2.		D				M	D
	BIOL 375	BIOL 396	BIOL 426	BIOL 427	BIOL 441	BIOL 480	BIOL 492
Goal 3.							
Outcome 1.		D	M	M	M		D
Outcome 2.			D	D		D	
Outcome 3.						D	
Outcome 4.	D	D	M	M	M		D
Goal 4.							
Outcome 1.	D	D	M	M	M	M	D
Outcome 2.		D	D	D			
Outcome 3.	D	D	D	D	D	M	

	BIOL 495	BIOL 498
Goal 1.		
Outcome 1.	D	D
Outcome 2.	D	D
Outcome 3.		M

Goal 2.		
Outcome 1.		D
Outcome 2.		M
Goal 3.		
Outcome 1.	M	D
Outcome 2.	M	D
Outcome 3.		
Outcome 4.	M	D
Goal 4.		
Outcome 1.	D	D
Outcome 2.		
Outcome 3.	D	D

B. Syllabi: Sample program syllabi which indicate where program goals are mapped are attached in Appendix A.

V. Learning Outcomes Assessment Methods and Measures

A. Entrance Assessment

All students at UAS are required to take placement tests in reading, writing, and mathematics. Developmental courses are available for students who score below the college level in these areas. The Fundamentals of Biology course sequence required of all pre-majors provides the basic concepts common to all biological fields in addition to an initial exposure to the scientific method, scientific writing and the peer-reviewed scientific literature.

B. Learning Outcomes by Course Level

The following descriptions serve as learning outcomes for sophomore-, junior-, and senior-level course in the B.A. program in Biology. These guidelines serve as a rubric for developing and implementing the program curriculum.

1. Sophomore-Level Courses

Sophomore-level courses introduce the content area within Biology and do not require advanced knowledge from other scientific areas (e.g. Chemistry). Course content includes terminology specific to Biology as well as techniques employed in the field.

Students who pass a sophomore-level course will have a basic foundation of knowledge in the course topic. They will have begun to acquire familiarity with library resources, both print and electronic.

2. Junior-Level Courses

In junior-level courses, course content assumes an increasing level of prior knowledge about the field of Biology. In this respect, course content may be more specific than that offered on the sophomore level. Course content may require advanced study in Biology or other scientific areas (e.g. Chemistry).

Students who pass a junior-level course have demonstrated an ability to master both theoretical and practical concepts in Biology. Students should be able to demonstrate an increasingly sophisticated use of library resources and should be able to access the primary scientific literature independently. Students take on increasing responsibility for contributing to and shaping class discussions. Students will have had practice in verbally presenting their work to an audience of peers.

Junior level courses may include a greater breadth of study in programs outside of Biology and students are encouraged to pursue a minor outside the biology discipline.

3. Senior-Level Courses

Senior-level courses are specific in content, assuming a base of prior knowledge in the field that is both broad and fairly detailed.

Students who pass a senior-level course have demonstrated the ability to master detailed information as well as the ability to think critically and evaluate scientific information. Students at this level will demonstrate the highest level of proficiency in utilizing library resources; their work will include proper and sophisticated use of documentation and references for research and

documentation. They will have taken a leadership role when contributing to class discussion and in presenting their work orally to their peers.

VI. Program Assessment Methods and Measures

A. The Biology Student Assessment Coordinator will facilitate program assessment based on the following:

- Surveying graduating seniors during an exit interview. The questions for the exit interview are included in Appendix B.
- Tracking student success in graduate entrance exams, such as the GRE.
- Tracking student retention.
- Tracking student success through graduate employment
- Tracking student success through acceptance in graduate school

B. Rubric – Student Levels of Proficiency

Use of this rubric will enable the Biology Student Assessment Coordinator to effectively aggregate and summarize student data in regard to student learning goals and outcomes. Overall Rating Scale:

Exceeds Expectations 1 = exemplary performance

Exceeds Expectations 2 = surpasses the standards and performance expectations

Meets Expectations 3 = very good performance; consistently meets standards and performance expectations

Meets Expectations 4 = good performance; generally meets standards and performance expectations

Does not meet expectations 5 = performance does not meet expectations; below expected levels; improvement needed

Does not meet expectations 6 = performance falls below expectations; substantial improvement critical

Goal 1. The graduate will master fundamentals of biological science.

	Exceeds Expectations	Meets Expectations	Does Not Meet Expectations
	1 2	3 4	5 6
Outcome 1.			
Outcome 2.			
Outcome 3.			

Goal 2. The graduate will understand fundamentals of mathematics, statistics, chemistry and physical sciences and how they relate to biological science.

	Exceeds Expectations	Meets Expectations	Does Not Meet Expectations
	1 2	3 4	5 6
Outcome 1.			
Outcome 2.			

Goal 3. The graduate will master an in-depth study of organismal-level biology.

	Exceeds Expectations		Meets Expectations		Does Not Meet Expectations	
	1	2	3	4	5	6
Outcome 1.						
Outcome 2.						
Outcome 3.						
Outcome 4.						

Goal 4. The graduate will master an in-depth study of a core in general biology.

	Exceeds Expectations		Meets Expectations		Does Not Meet Expectations	
	1	2	3	4	5	6
Outcome 1.						
Outcome 2.						
Outcome 3.						

VII. Assessment Cycle

A. Schedule: A reassessment of program needs/improvements will be conducted on a regular basis, including an annual review of curricular and pedagogical concerns. This will be conducted during the annual UAS convocation in August of each year. This will enable faculty from the three regional campuses to discuss, evaluate and make programmatic changes in response to data collected.

B. Procedures: Data collected from the student assessment methods and measures above, including the Student Levels of Proficiency Rubric, will be analyzed annually to assess the Marine Biology Program at UAS. Information derived from the data analysis will be used to evaluate the program, identify strengths and weaknesses in the program, and improve both curricular and pedagogical components of the program.

C. Responsibility: The Biology Assessment Program Coordinator will be responsible for coordinating student assessment activities and conducting the annual program assessment.

D. Timeline:

During the first cycle of assessment, the first goal and goal outcomes will be assessed:

Goal 1. The graduate will master fundamentals of biological science through:

1. Passing a two-semester sequence in Fundamentals of Biology
2. Understanding content areas pertaining to Biology
3. Understanding terminology specific to Biology
4. Understanding techniques employed in the field.

During the second assessment cycle, the second goal and goal outcomes will be assessed:

Goal 2. The graduate will understand fundamentals of mathematics, statistics, chemistry and physical sciences and how they relate to biological science through:

1. Passing fundamental courses in mathematics, statistics, chemistry and physical sciences
2. Understanding the content areas specific to the disciplines.

During the Third assessment cycle, the third goal and goal outcomes will be assessed:

Goal 3. The graduate will master an in-depth study of organismal-level biology, including ecology, physiology, genetics and evolution and related Biology electives

1. Passing organismal-level biology courses, including ecology, animal physiology, genetics and evolution

During the fourth assessment cycle, the fourth goal and goal outcomes will be assessed:

Goal 4. The graduate will master an in-depth study of a core in general biology that could include animal behavior, ornithology, phycology, physiology of marine organisms, behavioral ecology or marine ecology

1. Passing 4 core upper division courses in biology

VIII. Curriculum

Bachelor of Arts in Biology

The B.A. degree in Biology provides students with the opportunity to learn biological principles and skills in lecture, laboratory and field courses with a core curriculum in Biology.

Admission Requirements: Pre-major status: Applicants enter as pre-majors and will be considered for full admission to the B.A. in Marine Biology after completion of the following:

1. MATH S107 (may be met by placement examination)
2. ENGL S111.
3. BIOL S105, BIOL S 106
4. High school chemistry or CHEM S103 with a “C” or higher.

When a student becomes a major in Biology, he or she is assigned a faculty advisor. The student and faculty advisor plan the student’s curriculum, and the advisor’s signature is required on registration documents.

Degree Requirements: Candidates must complete the General Education Requirements (GERs) as well as the specific program requirements listed below for a minimum of 120 credit hours. Courses in a degree program may be counted only once. Courses used to fulfill the major requirements cannot be used to fulfill the GERs. Specific requirements for GERs in Marine Biology are listed below. The degree must include 48 credits of upper-division (300 or above) courses, 24 of which must be completed at UAS.

General Education Requirements 36

The following courses must be included in the GERs for a B.A. in Biology:
MATH 107, BIOL 105 and BIOL 106.

Major Requirements			36
BIOL	S271	Ecology	4
BIOL	S362	Genetics	4
BIOL	S482	Evolution	4
CHEM	S105	General Chemistry I	4
CHEM	S106	General Chemistry II	4
MATH	S108 or higher		3-4
STAT	S273	Elementary Statistics	3
select			
BIOL	S310	Animal Physiology	4
or			
CHEM	S____	Any Upper Division Course	4

Select two from the following (6 credits):

ASTR	S225	General Astronomy	3
ENVS	S101 or higher		1-4
GEOL	S104 or higher		3-4
PHYS	S102 or higher		3-4
STAT	S373 or higher		3-4
Biology Electives			10
BIOL	S215	Introduction to Marine Biology	3
BIOL	S239	Introduction to Plant Biology	4
BIOL	S300	Vertebrate Zoology	4
BIOL	S305	Invertebrate Zoology	4
BIOL	S375	Current Topics in Biology 2	
BIOL	S382	Wetlands Ecology	4
BIOL	S384	Marine Mammalogy	4
BIOL	S401	Phycology	4
BIOL	S415	Physiology of Marine Animals	4
BIOL	S426	Ornithology	4
BIOL	S427	Introduction to Ichthyology	4
BIOL	S441	Animal Behavior	4
BIOL	S445	Vascular Plants of Southeast Alaska	3
BIOL	S480	Aquatic Pollution	3
BIOL	S481	Marine Ecology	4
BIOL	S492	Biology Seminar	1
BIOL	S495	Behavioral Ecology	3
Breadth Electives			38

To include upper-division courses as needed. Students are encouraged to include a minor or double major.

Course Descriptions

The following are course descriptions for all courses listed in the above degree program. This includes descriptions for one new course and one minor change to an existing course description; all additions and changes required for Curriculum Committee review have been submitted on the required forms along with this proposal.

Biology Courses

BIOL S105 Fundamentals of Biology I

4 credits (3+3) J, K, GER

Introduction to basic principles of cell biology and evolution. Topics include cell structure, metabolism and genetics. Co-requisite: MATH S105.

BIOL S106 Fundamentals of Biology II

4 credits (3+3) J, K, GER

Continuation of basic principles of plants and animal anatomy and physiology. Topics include evolution, behavior, ecology, and groups of plants and animals. Prerequisite: BIOL S105; co-requisite: MATH S107.

BIOL S215 Introduction to Marine Biology

3 credits (3+0)

An introduction to the major characteristics of ocean ecosystems and the organisms that inhabit them. Includes physical, chemical, and biological principles that affect marine biodiversity. Prerequisite: BIOL S105 and S106.

BIOL S239 Introduction to Plant Biology

4 credits (3+3) J, K

Structure, function, ecology, and evolutionary patterns of the major groups of plants. Prerequisite: BIOL S105 and S106.

BIOL S271 Ecology

4 credits (3+3) J, K

Overview of the principles of ecology with emphasis on the organismal, population, community, ecosystem and biome levels. Aspects of the physical environment are included in the organismal ecology discussions. Laboratory sessions mainly are field exercises in biological sampling and analyses. Prerequisites: BIOL S105 & S106. Co-requisite: STAT 273.

BIOL S300 Vertebrate Zoology

4 credits (4+0) J

Evolution, classification, functional anatomy and general biology of vertebrates. Alaskan species will be highlighted. Prerequisite: BIOL S105 AND S106. No lab.

BIOL S305 Invertebrate Zoology

4 credits (3+3) J

Structure, function, classification, evolution and life histories of invertebrate animals. Marine invertebrate animals. Marine invertebrates are emphasized. Prerequisite: BIOL S105 and S106.

BIOL S310 Animal Physiology

4 credits (3+3) J

Chemical and physical principles underlying living processes, and the integration of these principles into the physiology of cells and whole organisms. Prerequisites: BIOL S105 and S106, MATH S107; Co-requisite: CHEM S341.

BIOL S362 Genetics

4 credits (3+2) J

Principles of inheritance; physiochemical properties of genetic systems. Prerequisites: BIOL S105 and S106, CHEM S106, MATH S107.

BIOL S375 Current Topics in Biology

1–2 credits (Variable) J

This course provides students with first-hand accounts of current research in the biological sciences. Seminar speakers will present research results in a variety of subdisciplines, and students will discuss the significance with presenters and instructor. Number of credits may vary from term to term. May be repeated. Prerequisites: Permission and completion of 3 science credits.

BIOL S382 Wetlands Ecology

4 credits (3+3) J

All of the major aspects of wetlands from ice fields, alpine bogs, tarns, lakes, streams, deltas to the marine shores, emphasis is on: 1) identification of wetland categories based on aquatic plants, hydrology and soil types; 2) value, preservation, protection and restoration of wetlands; 3) federal and state regulations and 4) management, economics and mitigated use of wetlands. Laboratories will be based on local Alaskan and Northwest regional case studies and accepted regional case studies and accepted wetlands research techniques. Prerequisite: BIOL S271.

BIOL S384 Marine Mammalogy

4 credits (3+3) J

The evolution and classification of marine mammals will be presented as a framework for understanding their adaptations, physiology, anatomy, behavior, ecology, reproduction, and mating systems. Current research techniques and conservation issues will also be reviewed. Students will write and present a paper on a special topic. Two field trips (dates TBA). Prerequisite: BIOL S105 and S106, S271 and permission.

BIOL S396 Field Studies in Behavior and Ecology

1–6 credits (Variable) J

This course provides intensive field study in selected topics in behavior and ecology with emphasis on field methods. Each student will conduct an individual research project. Field topics may entail a deferred grade. Projects may be associated with on-going research projects or new projects developed by the instructor and student. Letter grades or Pass/Fail may be arranged by permission of instructor. Number of credits will be determined by the scope of the project. May be repeated for up to 12 credits. Prerequisites: BIOL S105, S106, S271 and permission of instructor.

BIOL S401 Phycology

4 credits (2+4) J

Survey of freshwater and marine algae with emphasis on Alaskan species. Topics include: taxonomy, physiology, life histories, and ecology of the algae. Introduction to Plant Biology (BIOL S239) recommended before taking this course. Prerequisite: BIOL S105, S106.

BIOL S415 Physiology of Marine Organisms

4 credits (3+3) J

An integration of physiological concepts with ecology and evolution to examine how organisms adapt within a diversity of marine environments including the intertidal, subtidal and the deep sea. The course will emphasize biochemical adaptations within the processes of respiration, osmoregulation, thermoregulation, and metabolism of marine invertebrates, fishes, and marine mammals. Prerequisites: BIOL 310 and CHEM 341.

BIOL S426 Ornithology

4 credits (3+3) J

Evolution, classification, adaptations, distribution, behavior, breeding biology, population dynamics, and migration of birds. Several field trips. Prerequisite: BIOL S105 and S106.

BIOL S427 Introduction to Ichthyology

4 credits (3+2) J

Major groups of fishes, emphasizing the fishes of northwestern North America. Classification, structure, evolution, general biology and importance to man the major groups. Prerequisite: BIOL S105 and S106.

BIOL S441 Animal Behavior

4 credits (3+3) J

The mechanisms and adaptive nature of individual and social behaviors will be explored in lectures, readings, and laboratory and field exercises. Proximal and ultimate explanations for behavior are studied terms of genetics, ecology, and modern evolutionary theory. Laboratory and field exercises emphasize hypothesis testing through observation and analysis of behavior. BIOL S362 (Genetics) is highly recommended before taking this course. Prerequisite: BIOL S105, S106, S271 or consent of instructor.

BIOL S445 Vascular Plants of Southeast Alaska

3 credits (2+2) J

Vascular plants from all habitats (forest, alpine, muskeg, meadow, intertidal wetland, disturbed areas, etc.) will be collected and identified. Lab sessions will emphasize floral dissections and use of keys for identification. Students will make individual plant collections and prepare herbarium sheets which will be incorporated into the University Herbarium. Prerequisite: BIOL S239.

BIOL S480 Aquatic Pollution

3 credits (3+0) J

Discusses all major kinds of aquatic pollution including oil, heavy metals, organic wastes, pulp mill effluent, PCBs, pesticides, ocean dumping, radioactive wastes, thermal pollution, and marine litter. Effects on biological systems are emphasized. Emphasis is on Marine Systems. Prerequisites: BIOL S105 and S106, CHEM S106.

BIOL S481 Marine Ecology

4 credits (3+3) J

In-depth study of the paradigms regarding the distribution and abundance of marine organisms including analysis and discussion of current primary literature. Major emphasis on how

physical-biological interactions structure populations, communities, and ecosystems in the oceans. Students will complete a research project. Prerequisites: BIOL 271 and STAT 273.

BIOL S482 Evolution

4 credits (3+3) J

This course entails in-depth study of the mechanisms of evolution. The roles of genetic variation, natural selection, and adaptation, in speciation and other evolutionary processes will be examined in an historical content. Competing schools of thought from the era of The Origin of the Species to recent advances in molecular evolution will be considered. Prerequisites: BIOL S105, S106 and co-requisite: BIOL S362.

BIOL S492 Biology Seminar

1 credit (1+0) J

Provides students with first-hand accounts of current research in the biological sciences. Seminar speakers will present research results in a variety of disciplines, and students will discuss the significance with presenters and instructor. May be repeated. Prerequisite: BIOL S106.

BIOL S495 Behavioral Ecology

3 credits (3+0) J

This course will teach research skills in the area of behavioral ecology and examine current issues in the study of behavior. Emphasis will be on developing testable hypotheses pertaining to the adaptive nature of behavior. Each student, in consultation with the instructor, will develop a specific project and reading list. Readings will be discussed in classroom sessions. Students will be required to prepare a research proposal including a full literature review. Animal Behavior (BIOL S441) is strongly recommended before taking this course. Prerequisites: BIOL S105, S106, S271 or permission.

BIOL S498 Research in Biology

(1-6 Variable credit) J

Individual research in the biological sciences undertaken by a student in consultation with a member of the Biology Program faculty. Students may submit research ideas to faculty and develop them into project with faculty input. Requires consent of advisor and appropriate faculty supervisor.

Chemistry Courses

CHEM S105 General Chemistry I

4 credits (3+4) J, K, S GER

Introduction to chemistry, including atomic and molecular structure; the principles of chemical change and related energy changes. Four hours lab per week required. Prerequisites: high school chemistry and MATH S107.

CHEM S106 General Chemistry II

4 credits (3+4) J, K, S GER

Introduction to chemistry, including atomic and molecular structure; the principles of chemical change and related energy changes. CHEM S106 includes the chemistry of the elements. Four hours lab per week required. Prerequisite: CHEM S105 with a “C” or better.

CHEM S341 Organic and Biological Chemistry I

4 credits (3+4) J

Theory and laboratory covering the fundamentals of organic chemistry including functional group reactivity, stereochemistry and spectroscopy. The laboratory provides practical experience with emphasis on organic synthesis, natural products and structure identification. Four hours lab per week required. Prerequisite: CHEM S106 with a “C” or better.

CHEM S342 Organic and Biological Chemistry II

4 credits (3+4) J

Lecture and laboratory which introduce the fundamental principles of biochemistry. Topics include structure and function of biological molecules, properties of enzymes, kinetics, bioenergetics, metabolism and molecular biology. Four hours lab per week required. Prerequisite: CHEM S341 with a “C” or better.

Physics Courses

PHYS S103 College Physics I

4 credits (3+3) J, K GER

Classical mechanics including mechanical energy, waves, sound and fluids. Prerequisite: high school physics and MATH S107 and MATH S108.

PHYS S104 College Physics II

4 credits (3+3) J, K GER

Electricity, magnetism, optics and an introduction to modern physics. Prerequisite: PHYS S103.

PHYS S211 General Physics I

4 credits (3+3) J GER

Calculus based study of principles of mechanics. Topics include energy, oscillations, sound and fluids. Prerequisites: high school physics and MATH 200.

PHYS S212 General Physics II

4 credits (3+3) J GER

Continuation of PHYS S211. Topics include electricity, magnetism, and optics. Prerequisite: PHYS S211.

Statistics Courses

STAT S273 Elementary Statistics

3 credits (3+0) J, K, S

Introduction to data analysis, least-squares regression, data production, sampling distributions, probability, confidence intervals, hypothesis testing, detection and analysis of patterns in data. Prerequisite: Math S107 or equivalent.

Appendix A. Sample Syllabi

Fundamentals of Biology 1I Biology 106

Instructor: Dr. Sherry Tamone
Office: AD 312 **Phone:** 465-6599
Office Hours: M, W, F 8:30-10:00 a.m.; Mondays 3:30-5:00
email: sherry.tamone@uas.alaska.edu

Lecture Room: **HB 113** Monday, Wednesday, Friday. 10:20-11:20 p.m.
Required Text: Campbell, N. A. (2005). Biology, 7th Ed. Benjamin/Cummings
Redwood City, CA

Pechenik, J. A.(1999) A short guide to writing about biology

Laboratory: **AD 314** Section 01 (12:00-3:00 Friday) Danielle Underwood
AD 314 Section 02 (11:30-2:30 Tuesday) Danielle Underwood
AD 314 Section 03 (8:00-11:00 Tuesday) Johnny Zutz

Teaching Assistants **Danielle Underwood** (MS Fisheries, candidate)
Email: d.underwood@uaf.edu
Johnny Zutz (MS Fisheries Candidate)
j.zutz@uaf.edu

Lab Manual: Morgan, J. G. and Carter, M. E. (2005). Investigating Biology
Pearson/Benjamin/Cummings, Redwood City, CA 5th Edition

AD= Anderson Building **HD=** Hendrickson Building

Objectives: This course is a prerequisite for all other higher-level courses offered in the biology program including Invertebrate Zoology, Animal Behavior, Phycology, Evolution, Ecology, Genetics, Ichthyology, and Animal Physiology. This course is designed to introduce students to the diversity of life forms and will include evolutionary relationships among organisms. In addition to animals, we will discuss plants, fungi, protists, and prokaryotes. Your knowledge of the chemical principals important to biology will be important in understanding basic plant and animal physiology. As with Biology 105, we will continue to emphasize the scientific process. Students will be exposed to scientific literature and be asked to discuss and evaluate journal articles. You will be expected to use the Egan library for your laboratory research paper and to become familiar with literature searches using biological databases. By the end of this course, students should have a better appreciation for primary literature and the peer-review process.

Students will be introduced to the following student outcomes in this course:

- Understanding and articulating the major content areas of biology (evolution, genetics, chemical processes)
- Articulating biological terminology
- Understanding through laboratory exercises contemporary techniques employed in the biological fields
- Understanding and articulating the fundamentals of mathematics, statistics, chemistry and the physical sciences

Course Competencies:

This course addresses six competencies that baccalaureate degree students should attain during their studies at UAS.

1. Communication
2. Quantitative skills
3. Information literacy
4. Computer usage
5. Professional behavior
6. Critical thinking

For more information on these competencies, see the Academic Catalog.

The Laboratory: Each student needs to be enrolled in a laboratory section for Biology 106. There are 3 sections and a teaching assistants will organize these sections. The grading policies and expectations will be clearly discussed with students during the first laboratory meeting. The laboratories have been designed to complement the lecture material and students should gain a practical knowledge of the biological concepts explained during the lecture portion of the class. In addition, there will be field trips that require your attendance. Dress appropriately for these outings! Discussions are an integral part of the biology laboratory and class participation is greatly encouraged. Laboratory attendance is an important component of your laboratory grade. Your grade can be affected if one or two laboratories are missed. Absence from three laboratories will result in an F in the course.

Examinations and Quizzes: During the lecture portion of Biology 106, there will be 3 midterm exams worth 100 points apiece. The final is worth 100 points and will essentially be equivalent to a 4th midterm. There will also be 2 laboratory practicals worth 100 points apiece. Laboratory quizzes are at the discretion of the laboratory TAs and if given will be given during the first 15 minutes of lab.

Grading Policies: I calculate your grade from a total of your points earned. Make-up exams will only be given with the **prior** consent of the instructor (S.T.). If you are sick on the day of the exam, you must contact me by email or phone prior to the exam.

3 midterms @ 100 points apiece	300
1 final @ 150 points	150
2 laboratory practicals @ 100 points apiece	200

Laboratory assignments (quizzes or homework questions)	50
Laboratory Participation	50
Total points	750

Regrade Policy: If a student wishes a regrade on an assignment or exam, the student must request the regrade in writing within 48 hours of the assignment or exam being returned. The request must include the question/topic in dispute.

Late Assignment Policy: All tests, presentations, and lab assignments must be completed and handed in on the required date. Your grade for that assignment will be decreased 10% by each class day your work is late. After one week, late assignments will not be accepted. Exceptions can be made only if discussed and approved well in advance of absence.

Grading

Grades will be assigned according to the total amount of points earned in the class.

> 675 points = A

> 600 points = B

> 525 points = C

> 450 points = D

< 450 points earned in this class will result in an F

I reserve the right to give pluses and minuses

Hints for Success: As always, attending lecture is extremely important to the success of each student. If you miss a lecture, make sure you can get notes from someone in class. Do not wait until the last minute to study for an exam. Allocate at least 2 hours three times a week during which you can study Biology. In addition to the biological knowledge that you learn in this course, you will become more successful with time management. If you feel that you are falling behind, please come see me in my office at the earliest possible time. Feel free to make an appointment with me at the end of class or by email.

Cheaters never prosper! (Not if I have anything to do with it) If you are caught cheating on a quiz or an exam, you may receive an F in this course. If you knowingly plagiarize material for your research paper or laboratory assignments you will receive an F in the class and be subject to suspension from the university. If you are unclear as to the definition of plagiarism, please see me. You may also refer to the student code of conduct in your UAS catalog for explanations concerning your rights and responsibilities.

Biology 106 Course Outline

Date		Readings (Ch)
W Jan 18	Introduction to the course/Tracing Phylogeny	25 (491-498)
F Jan 20	Origins of Life on Earth	26
Week 1 Laboratory No laboratory Scheduled		
M Jan 23	Prokaryotes/Origins of Metabolic Diversity	27
W Jan 25	Origins of eukaryotic diversity	28
F Jan 27	Eukaryotic Diversity	28
Week 2 Laboratory: <i>The Use of the Microscope: Exercise 3.1; 3.2; 3.3.</i> <i>A survey of the Kingdom Protista: Exercise 14.1</i>		
M Jan 30	An overview of plant evolution/ Bryophytes	29
W Feb 1	Origin of Vascular Plants	29
F Feb 3	Plants with Seeds	30
Week 3 Laboratory: <i>Diversity of Plants Ex: 15.1, 15.2, 16.1, 16.2</i>		
M Feb 6	Flowering Plants	30
W Feb 8	Fungi	31
F Feb 10	Midterm 1 (100 points) Take this at the Learning Center	
Week 4 Laboratory: <i>Fungi Ex: 14.2 May include a hike up Auke Nu Trail</i>		
M Feb 13	Introduction to animal evolution	32
W Feb 15	Invertebrates Part I	33
F Feb 17	Invertebrate Diversity II	33
Week 4 Laboratory: <i>Sponges, Cnidarians and Worms Ex17.1, 17.2, 17.3, 17.4</i>		
M Feb 20	Deuterostomes Invertebrate Chordates	33
W Feb 22	Origin of vertebrates	34
F Feb 24	Aquatic Vertebrates	34
Week 5 Laboratory: <i>Arthropods, Molluscs, and Echinoderms: Exercise 17.5, 18.1; 18.2, 18.3</i>		
M Feb 27	Terrestrial vertebrates	34
W Mar 1	Terrestrial Vertebrates	34
F Mar 3	Midterm 2 (100 points)	
Week 6 Laboratory: <i>Invertebrate Chordates/Vertebrate Diversity: Exercise 18.4</i>		
M Mar 6	Plant Structure/growth	35
W Mar 8	Transport in Plants	36
F Mar 10	Plant Nutrition	37
Week 7	Laboratory Practical to cover material from week 1-6 (100 points)	

Mar13- Mar 17 *Spring Break No Classes YAHOO: Time to catch up with coursework!*

M Mar 20	Plant Reproduction	38
W Mar 22	Animal Structure and Function	40
F Mar 24	Animal Nutrition and Growth	41

Week 10 Laboratory: *Plant Anatomy and Physiology Ex 19.1; 19.2; 19.3, 19.5*

M Mar 27	Immunology	43
W Mar 29	Immunology/AIDS	43
F Mar 31	Animal Reproduction	46

Week 11 Laboratory: *Immunology: (Handout).*

M Apr 3	Animal Development	47
W Apr 5	Animal Development	47
F Apr 7	Review	

Week 12 Laboratory: *Reproduction and development Ex 23.2, 24.1 (modified); 24.4*

M Apr 10	Midterm 3 (150 points)	
W Apr 12	Introduction to Ecology	50
F Apr 14	Ecology and the Biosphere	50

Week 13 Laboratory: *Ecology: Ecology Lab or Animal Behavior Lab (TBA)*

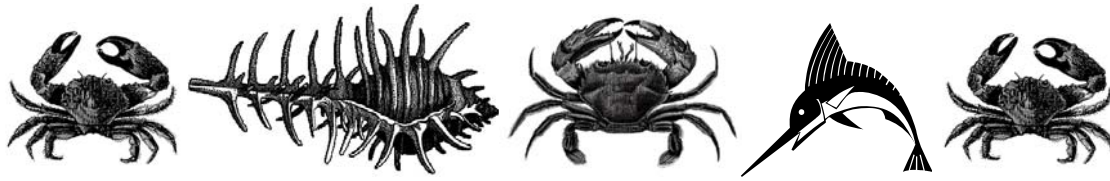
M Apr 17	Behavioral Ecology	51
W Apr 19	Population Ecology	52
F Apr 21	Community Ecology	53

Week 14 Laboratory: *Succession: a field trip to the glacier*

M Apr 24	Ecosystems	54
W Apr 26	Ecosystems	54
F Apr 28	Conservation Biology	55

Week 15 Laboratory Practical: *100 points will cover material from week 8-14*

Final Examination: *May 1 2005, 10:00-12:00 (good luck) 100 points in HB 113*



BIOLOGY 415 PHYSIOLOGY OF MARINE ANIMALS

Instructor	Dr. Sherry Tamone Phone: 465-6599 Office: AD312 Office Hours: Monday, Wednesday, and Friday. 9-10 am; 3-4 pm Email: sherry.Tamone@uas.alaska.edu
Lectures	Monday and Friday, 12:00-1:30 pm AD224
Laboratory	Wednesday 12-3:00 pm; AD314
Required Text	Animal Physiology, Adaptation and Environment Schmidt-Nielsen, 5 th Edition, Cambridge Press Handouts and extra readings will be assigned.
Prerequisites	Biology 310 (C or better), Chemistry 341, or the direct consent of the instructor.

Course Objectives: My objectives for teaching this course are to integrate many of the concepts that you have learned in previous more specialized courses (physiology, biochemistry, evolution) within the context of evolutionary physiology. More specifically, I aim to examine physiological adaptations of marine organisms because of our proximity to the marine environment and our uncanny interest in marine animals. Some of the environmental challenges facing marine animals have their basis in oxygen availability, temperature changes, and osmotic fluctuations. We will examine biological adaptations in enzymes, structural proteins, and other cellular constituents to understand how animals solve the problems associated with diverse marine environments. Additionally it is my goal to convey the experimental approach to physiology through the discussion of pertinent primary literature that emphasizes certain methodology. There is a laboratory component to this course through which each study should gain valuable hands-on research experience.

Exams: There will be two examinations worth 150 points apiece (see course outline). The first exam will cover lecture material up to and including February 25. The second exam will emphasize material covered after February 28, but may also include earlier material. Bring a calculator to each exam. Makeup exams are given ONLY with prior consent of the instructor!

Research Projects: During the first weeks of the course you will decide upon your research partner and the research project that you will complete by the end of the semester. We will use

the laboratory periods in part to discuss primary literature relevant to your projects and to conduct the research for your projects. It is expected that all of your data collection will not take place during a 3-hour block but may require coming in at non-laboratory hours.

Research Presentation: Students will give a 25-minute presentation on their research project (whether it worked or not) in PowerPoint format. Students are expected to utilize visual aids effectively and present the material without reading a script. Your presentation will be graded with the following considerations

- a) Introduction: a thorough review of the literature and a clear and concise statement of your hypothesis
- b) Methods: Present your experimental design and methods of statistical analysis that you used to test your hypothesis
- c) Results: Well labeled graphics and/or tables are mandatory
- d) Conclusions: You should discuss how your results support your hypothesis and some future directions

Grading: Your grade will reflect an accumulation of your total points earned in the class. Exams (300); Primary Literature Discussion (50); Research Project Proposal (75); Research Presentation (75); Participation and Professionalism; participation includes writing one critique of a presentation (50)

Students will develop the following student outcomes in this course:

- Understanding and articulation of the integration of ecology and physiology

Students will master the following student outcomes in this course:

- Understanding and articulation of the fundamentals of biological science including evolution and the chemical processes of life
- Understanding and articulation of the terminology used in the biological sciences
- Understanding through laboratory research some of the contemporary techniques used in the physiological sciences
- Understanding and articulation of the fundamentals of mathematics, statistics, and chemistry used in the biological sciences
- Integrating the fundamentals of mathematics, statistics, and chemistry used into physiological processes

Competencies

In this course you will be expected to improve upon

- 1) Writing skills: each student will write a research proposal concerning their research project
- 2) Communication skills: each student will give a presentation covering their research project
- 3) Information Literacy: student will read upper division level texts and primary literature
- 4) Computer Usage: students will analyze their data using contemporary software

- 5) Professionalism: students will work in a collaborative manner and be held responsible for completing coursework in the time provided.
- 6) Critical thinking: students will take part in discussions during which integrating concepts plays an important role. We will analyze and critique some current literature in physiology literature

Course Outline/Physiology of Marine Animals

Date	Topic	Readings
1/19	Introduction to the course	
1/21	Biochemical adaptation and evolutionary physiology	
1/24	Overview of biochemistry and enzyme kinetics	
1/26	<i>Further discussion of Research Projects: Set Temperature Loggers in the Field</i>	
1/28	Environmental oxygen	Chapter 1
1/31	Blood	Chapter 2
2/2	Molting Hormone Analysis: The enzyme-linked immunosorbant assay (ELISA): read handout prior to lab, please Literature Search Due	
2/4	Bioenergetics	Chapter 4
2/7	Bioenergetics	Chapter 5: Handout on scaling problems
2/9	Bioenergetics: Effects of temperature on metabolic rates of hermit crabs (Q ₁₀ values)	
2/11	Bioenergetics	Chapter 5
2/14	Circulation/hemoglobins	
2/16	Measuring Glucose in a Crustacean: effects of stress	
2/18	Adaptations in diving mammals	Chapter 5
2/21	Adaptations in diving mammals	
2/23	Primary Literature Discussion: Ponganis, P. J., Kooyman, G. L., and Castellini, M. A. (1993). Determinants of the aerobic dive limit of Wedell seals: analysis of diving metabolic rates, postdive end tidal P _{O₂} 's and blood and muscle oxygen stores. <i>Physiol. Zool.</i> 66: 732-749	
2/25	1 st Examination	
2/28	Thermotolerance	Chapter 6
3/2	Measuring Heat Shock Proteins in marine Invertebrates: Step One...Separating proteins using gel electrophoresis, transferring and blocking Concept Papers are Due that include Title, introduction, and Methods	
3/4	Temperature, Heat and Heat Transfer	
3/7	Heat Shock Proteins	Primary Literature on hsp's
3/9	Measuring Heat Shock Proteins in Marine Invertebrates: Developing the Western Blot	
3/11	Discussion of article by Carpenter and Hoffman	
3/14-3/20: Spring Break No Classes....But You May Work On Your Project		

3/21	Cold water adaptation in fish	
3/23	RESEARCH TIME	
3/25	Thermoregulation in polar bears (a marine mammal)	
3/28	Anhydrobiosis	Handout of Review Article by Crowe and Crowe
3/30	Data Acquisition	
4/1	Anhydrobiosis	
4/4	Discussion of Anhydrobiosis: Clegg, J. S. (2000). Embryos of <i>Artemia franciscana</i> survive four years of continuous anoxia: the case for complete metabolic rate depression	
4/6	Data Acquisition	
4/8	Thermal Vent Animals and their Physiology	
4/11	Discussion of Article: Childress, J. J., Fisher, C. R., Favuzzi, J. A., Kochevar, R. E., Sanders, N. K., Alayse, A. M. (1991). Sulfide driven autotrophic balance in the bacterial symbiont-containing hydrothermal vent Tubeworm, <i>Riftia pachytila</i> (Jones). <i>Biological Bulletin</i> 180: 135-153	
4/13	Data Acquisition	
4/15	Pressure and Deep Sea Marine Creatures	
4/18	Buoyancy	Chapter 10
4/20	Data Analysis and Graphics/ Will need Laptops in the room	
4/22	Second and Last Examination	
4/25	Research Presentations (2): Mullins/Hutter & Vanzant/Vanzant	
4/27	Research Presentations (3): Lucas/Strong/Vanderjack	
4/29	Research Presentations (2): Antonio/Doyle & Brouhard/Evans	

of simulations to build a framework for discussing evolution. After the first few weeks, each student will take a turn leading discussion of a chapter from *The Origin of Species*. Additional readings may also be used for discussions. All students will read the readings before discussion and email me at least two written (non-trivial) questions based on the reading by 8 am on the morning of discussion. Participation in discussion sessions is essential to doing well in this course.

Grades will be based on the following:

- (1) Three sections exams (180 points total; 60 points each).
- (2) Discussion/lab (230 points). This includes active participation in weekly discussion groups, completion of computer labs/problem sets and problems, and successful leading of one discussion period. Discussion points (50 points) will be assessed each week based on attendance (20%), asking and answering questions (40%), and participating in discussions (40%). An additional 30 points can be earned for discussion questions sent to me. Successful completion of computer exercises and problem sets is worth 50 points. Each student will also receive up to 100 points for facilitating a discussion of a chapter (or paper). Facilitation includes doing background reading and providing a written summary of the reading (30 pts), and developing stimulating questions and ensuring all students participate in discussion (70 pts).
- (3) Comprehensive final exam (190 points).

Final letter grades will be based on the total points achieved from the total of 600 points from the above measures.

Letter Grade	Points
A	≥540
B	480-539
C	420-479
D	360-419
F	<360

ADA Compliance: If you experience a disability and would like information on support services, contact UAS Disability Services representative Michelle Federico, Student Resource Center, Novatney Building.

Plagiarism/Cheating: Students are reminded to consult the course catalog for the Student Code of Conduct. Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated in this class. According to University policy, you will be given an F in this class if you are caught cheating or plagiarizing. Repeated offenses will most likely result in expulsion from UAS. Cheating is when a student gives or receives any form of assistance during an examination or quiz. Plagiarism is defined as the submission or presentation of work, in any form, that is not a student's own, without acknowledgment of the source. However, asking someone for advice

and help is not plagiarism. Submission of the same work in more than one course without prior approval of all professors responsible for the courses is also considered academic dishonesty.

Students will master the following student outcomes in this course:

- Understanding and articulation of the fundamentals of biological science
- Understanding and articulation of the terminology used in the biological sciences
- Understanding and articulation of the fundamentals of mathematics, statistics, and chemistry used in the biological sciences
- Integrating the fundamentals of mathematics, statistics, and chemistry used into physiological processes
- Understanding and articulation of the major principals of genetics
- Understanding and articulation of the major principals of the mechanisms of evolution

UAS Competencies:

In this course, the following UAS competencies will be addressed:

- written communication through essay exams, journal reflections and journal article summaries
- oral communication through class discussion and formal presentations
- critical thinking through exams, journal reflections, group activities and discussions, writing journal article summaries, and the formal presentation
- information literacy through researching information to be used in the formal presentation and finding journal articles to summarize
- quantitative skills through evaluating and summarizing quantitative research in journal article summaries
- computer usage through the use of UAS Online to submit journal reflections
- professional behavior through classroom participation and conduct, as well as the formal presentation

Appendix B. Exit Interview Questions

- 1) Are you satisfied with your education in Biology at UAS?
- 2) What are your career goals? Do you feel that the UAS Biology degree prepared you well for this career? Why or why not?
- 3) Do you feel the coursework in the Biology degree included
 - a) fundamentals of biological science?
 - b) fundamentals of mathematics, statistics, chemistry, and physical science?
 - c) an understanding of the relationship of mathematics, statistics, chemistry, and physical science to biology?
 - d) in-depth study of organismal-level biology, including ecology, physiology, genetics and evolution and related Biology electives?
 - e) in-depth study of a core in biology that could include invertebrate zoology, marine mammalogy, phycology, animal behavior, ichthyology or marine ecology
- 4) Can you reflect on the preparation that you received in
 - a) communication (presentations to classes, discussion courses)?
 - b) quantitative skills?
 - c) information literacy?
 - d) computer usage?
 - e) professional behavior?
 - f) critical thinking?
- 5) Was there one course that embodied the essence of the Biology degree for you? If so, which one?
- 6) What was the best part of your experience at UAS?
- 7) What was the worst part of your experience at UAS?
- 8) We like to keep in touch with our graduates to track their career paths. Please provide a permanent e-mail and a permanent phone number where we might reach you in the future.

Thank you!