CNAS ASSESSMENT COMMITTEE
BIOLOGY (BI) DEGREE PROGRAM
CURRICULAR MAPPINGS AND COURSE EXPECTED STUDENT LEARNING OUTCOMES (SLOs)

I. CURRICULAR MAPPINGS

A. DEGREE PROGRAM CURRICULAR MAPPING

DEFINED PROGRAM SLOs

- **BI PR-1**: Disciplinary knowledge and skills: Graduates use their knowledge & understanding of essential concepts to solve problems in ecology, genetics, molecular biology, systematic, & evolution. They can apply their biology knowledge & skills to locally important issues such as island biogeography, conservation, & endangered species problems. They apply relevant concepts from chemistry & physics to biology problems.
- **BI PR-2**: Quantitative skills: Graduates apply numerical methods in research design, and use computers for analysis manipulating and modeling biological data.
- **BI PR-3**: Research/Laboratory skills: Graduates are competent in basic biology procedures & safety in the laboratory & the field; they formulate testable hypotheses & create effective experimental designs using their knowledge, understanding, & practical experience of scientific instruments.
- **BI PR-4**: Communication skills: Graduates use scientific literature & diagrams as a source of information, properly cite sources & avoid plagiarism, & create text & graphics to communicate results effectively through print & oral presentations. They collect & assess evidence & use it to create effective arguments in writing scientific reports & proposals.
- **BI PR-5**: Digital Literacy: Graduates use & process information in multiple formats via computer. Graduates are competent in the following computer skills as related to their science work: desktop competencies, work processing, presentation, and data retrieval and manipulation. Graduates effectively judge the usefulness and accuracy of external sources of information.
- **BI PR-6**: Professionalism: Graduates work effectively together in teams in a laboratory and field settings and follow ethical principles underlying scientific research and publication. Graduates understand and apply the values and limitations of scientific research in addressing public policy issues.

COURSE NO. (Required or recommended for major)	**LINK TO PROGRAM SLOs (The numbers are course SLO numbers that link the course to the program SLO – See Section II for the defined course SLO numbers)**					
	BI PR-1	**BI PR-2**	**BI PR-3**	**BI PR-4**	**BI PR-5**	**BI PR-6**
BI120	2			1,2	3	2
BI157	1	2	2,3	1,2,3	3	1,2,3
BI157L	1	2	2,3	1,2,3	3	1,2,3
BI158	1	1	2,3	3	1,2,3	1,2,3
BI158L	1	1	2,3	3	1,2,3	1,2,3
BI302/BI302L	1,2,3,4		3,5	3	5	
BI303	1,3		2,3	1	1,2,3	1,2,3
BI303L	1,3		2,3	1	1,2,3	1,2,3
BI310	1,2,3,4,5	2,4,5	4,5	1,3	2,4,5	1
BI315	1,2,3,4,5	1,4,5	4,5	1,2,3	1,4	4,5
BI315L	1,2,3,4,5	1,4,5	4,5	1,2,3	1,4	4,5
BI320	1		1	1	1	2
BI321	1			1,2,3	2	
BI333	1,3		2,3	1,3	1,2,3	1,2,3
BI333L	1,3		2,3	1,3	1,2,3	1,2,3
BI365	1,2	1	2,3,4	1,2	1,2,3,4	1,2,3,4
BI365L	1,2	1	2,3,4	1,2	1,2,3,4	1,2,3,4
BI 410	1	1,2,3	2,3	1,2,3	1,2,3	1,2,3
BI412/BI 412L	1	2	2,3	1,2,3	3	1,2,3
BI 416	7,9,10	7,4	8	8,9,10	9,10	10
BI 416L	2,3,4,9,12	2,9,10	10,11	14	10,11,14	10
BI 419	3,4,6,10	4,6	4,10	3,10	3,4,10	10
BI 419L	1,2,3,4	1,2,3,4	4,5,6,7	4,5	1,2,4,5	
BI 425	2,3,4,9	9,11	5,7,9	4,5,7	4,5,7	4,5,8
BI 425L	6,7,8,9	5	3,10	3,10	3,10	3,10

B. BIOLOGY GE CURRICULAR MAPPING

DEFINED GE SCIENCE SLOs

- **SC GE-1**: observe, describe, and interpret natural and experimental phenomena within the context of a scientific paradigm;
- **SC GE-2**: develop and employ skills of logical and critical thinking to collect and analyze data, interpret results, and write reports;
- **SC GE-3**: characterize scientific knowledge as theories and principles that result from experimentation that are subject to revision based on new observations and discoveries;
- **SC GE-4**: apply basic scientific principles and methods to explore the workings of the natural world, particularly in this region;
- **SC GE-5**: apply basic scientific principles and methods to solve real-world problems, and make appropriate use of science in their choices as citizens.
- **SC GE-6**: identify the capabilities and limitations of science, and distinguish science from pseudoscience;
- **SC GE-7**: identify how scientific ideas and values have been integrated into society and how other aspects of society affect science as a human activity.

COURSE NO.	LINK TO GE SLOs (The numbers are course SLO numbers that link the course to the program SLO – See Section II for the defined course SLO numbers)						
	SC GE-1	**SC GE-2**	**SC GE-3**	**SC GE-4**	**SC GE-5**	**SC GE-6**	**SC GE-7**
BI100/BI 100L	1	2,3	4	2	5	6	
BI 157	1,2	1,2,3	1,2,3	1,2	1,2	1	1
BI 157L	1,2	1,2,3	1,2,3	1,2	1,2	1	1
BI 158	1,2	1,2,3	1,2,3	1,2,3	1,2	1	1
BI 158L	1,2	1,2,3	1,2,3	1,2,3	1,2	1	1
BI 212	1,2,3,4,5,6,7,			1,2,3,4,5,6,7	1,2,3,4,5,6,7,		
BI 212L	1,2,3,4,5,6,7			1,2,3,4,5,6,7,	1,2,3,4,5,6,7		
BI 225[1]							
BI 225L[1]							
BI 303	1,2	1,2	1,2	1		1	1
BI 303L	1,2	1,2	1,2	1		1	1
BI 310	1,2,3,4,5	2,3,4,5	1,3	4,5	1,2,3,4,5	1,3	1,3
BI 315	1,2,3,4,5	1,4,5	1,2,3	4,5	1,4,5	1	1,4,5
BI 315L	1,2,3,4,5	1,4,5	1,2,3	4,5	1,4,5	1	1,4,5
BI 333	1,2	1,2	1,2	1		1	1
BI 333L	1,2	1,2	1,2	1		1	1
BI 365	1,2	1,2	1,2	1,3,4	1,2	1	1,2,4
BI 365L	1,2	1,2	1,2	1,3,4	1,2	1	1,2,4
BI 410	1,2	1,2	1,2	1,2,3	1,2,3	1	1,2
BI412/BI 412L	1,2	1,2,3	1,2,3	1,2	1,2	1	1
BI 474	1	2	3	4	5	6	7

[1]**Pending Faculty Input**

B. BIOLOGY SUPPORT PROGRAM IN NURSING CURRICULAR MAPPING

DEFINED BIOLOGY/NURSING SUPPORT PROGRAM SLOs (IN PROGRESS)

- **BI NU-1**: Disciplinary knowledge and skills: students will be able to demonstrate their foundational knowledge of the major fields of biology, through their focus on anatomy, physiology, and microbiology. They will be able to apply their knowledge as health care consumers or concerned citizens with regard to public health issues.
- **BI NU-2**: Laboratory skills: students will demonstrate competency in a range of biological laboratory skills, use of scientific instruments, and safety in the laboratory.
- **BI NU-3**: Quantitative and analytical skills: students will demonstrate their ability to test hypotheses, collect scientific data, analyze those data, and interpret results using critical thinking.
- **BI NU-4**: Communication skills: students will demonstrate their ability to communicate by writing in a clear and concise manner, through a combination of lab reports, lab review exercises, and written exams.

COURSE NO.	LINK TO BI/NU SLOs (The numbers are course SLO numbers that link the course to the program SLO – See Section II for the defined course SLO numbers)				
	BI NU-1	**BI NU-2**	**BI NU-3**	**BI NU-4**	**BI NU-5**
BI124	1,2,3,4,5		2,4,5	1,2,3,4,5	
BI124L	1,2,3,4	1,2,3,5,6	1,2	1,3,4	
BI 125	1,2,3,4,5,6		2,3,4,5	1,2,3,4,5,6	
BI 125L	1,2,3,4	1,2,5	1,2	1,3,4	
BI225	1,2,3,4,				1,2,3,4
BI225L	1,2,3,4	1,2,3,4			

II. BIOLOGY APPROVED COURSE EXPECTED SLOs

COURSE NO. & TITLE	COURSE SLOs
BI100: Environmental Biology	A. The successful student will demonstrate the following essential science **skills:** 1. Answer questions about the data in scientific graphs and tables; 2. Propose hypotheses to solve environmental questions; 3. Collect and analyze data for a simple study, interpret the results and write a report in scientific style; 4. Describe the process of science to show how hypotheses are tested, how theories are supported or modified by evidence, and how the public should determine and respond to the differing levels of certainty in various theories. B. The successful student will demonstrate application of the following **core ideas** to interpret current environmental issues: 1. Observation and comparison are methods in biological research that are as valid as doing controlled experiments; in some areas of science controlled experiments are impractical or impossible. 2. Scientific conclusions are judgments not proofs, so the level of confidence in a conclusion (probability of being right) must be expressed with appropriate tentative language. *Corollary*: Scientific hypotheses and theories can be revised on the basis of new evidence. 3. A theory in science is a well-supported and broad-based consensus built on many lines of evidence from tested hypotheses. 4. The patterned complexity of living systems is hierarchically organized; higher levels in the hierarchy are characterized by the emergence of new properties. *Corollary*: Ecosystems cannot be fully understood by study of their component parts. 5. Carbon and other materials are continually recycled through food webs but energy must be constantly supplied anew (usually from the sun). 6. Introduced species and habitat destruction are among the most serious threats to island ecosystems. 7.Global warming and sea level rise are certainly happening and are very likely (more than 90% certainty) due to human increases in greenhouse gases, especially carbon dioxide. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI100L: Environmental Biology Laboratory	A. The successful student will demonstrate the following essential science **skills:** 1. answer questions about the data in scientific graphs and tables; 2. propose hypotheses to solve environmental questions; 3. collect and analyze data for a simple study, interpret the results and write a report in scientific style; 4. describe the process of science to show how hypotheses are tested, how theories are supported or modified by evidence, and how the public should determine and respond to the differing levels of certainty in various theories. B. The successful student will demonstrate application of the following **core ideas** to interpret current environmental issues:

	1. Observation and comparison are methods in biological research that are as valid as doing controlled experiments; in some areas of science controlled experiments are impractical or impossible. 2. Scientific conclusions are judgments not proofs, so the level of confidence in a conclusion (probability of being right) must be expressed with appropriate tentative language. *Corollary*: Scientific hypotheses and theories can be revised on the basis of new evidence. 3. A theory in science is a well-supported and broad-based consensus built on many lines of evidence from tested hypotheses. 4. The patterned complexity of living systems is hierarchically organized; higher levels in the hierarchy are characterized by the emergence of new properties. *Corollary*: Ecosystems cannot be fully understood by study of their component parts. 5. Carbon and other materials are continually recycled through food webs but energy must be constantly supplied anew (usually from the sun). 6. Introduced species and habitat destruction are among the most serious threats to island ecosystems. 7. Global warming and sea level rise are certainly happening and are very likely (more than 90% certainty) due to human increases in greenhouse gases, especially carbon dioxide. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI103: Marine Biology	**PENDING FACULTY INPUT**
BI103L: Marine Biology Laboratory	**PENDING FACULTY INPUT**
BI110: Human Biology	**PENDING FACULTY INPUT**
BI110L: Human Biology Laboratory	**PENDING FACULTY INPUT**
BI120: Scientific Prose	1. Use critical thinking skills including to extract key concepts, explain or use scaffolding to summarize, make inferences, and identify supporting evidence in scientific prose and the accompanying illustrations at the level of introductory biology and from scientific literature written for the educated public (e.g., *Scientific American).* 2. Discuss key characteristics and consequences of the scientific paradigm including methods, processes, linguistic insights e.g., Tentative Language for degrees of certainty, the need for criteria, and Responsible Conduct of Research; explain and effectively use the structure of scientific laboratory reports and journal articles. 3. Process scientific information in multiple formats via computer, using desktop competencies including word processing and email. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI124: Human Anatomy and Physiology I	During or by the end of the course students will be able to (as evaluated through written quizzes, tests, and exams): 1. identify the components and subcomponents of the integumentary, skeletal, muscular, and nervous systems; 2. recognize the functional relationships within and among the integumentary, skeletal, muscular, and nervous systems in maintaining homeostasis; 3. recall the cytology and histology of human cells, tissues, and organs;

	4. recognize and interpret the relationships between chemistry and physiology as they relate to cellular and sub-cellular processes; such as enzyme activity, cell-membrane function, muscle contraction, and nervous system control; and 5. apply basic knowledge of anatomy and physiology to demonstrate and infer the complementarity of structure and function when the body exhibits homeostasis and during pathological deviations from homeostasis. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI124L: Human Anatomy and Physiology I Laboratory	During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams): 1. record, analyze, and interpret data from computer-simulated laboratory exercises on cell transport, skeletal muscle physiology, and neurophysiology; 2. dissect, differentiate, locate, and identify on a cat components and subcomponents of the integumentary, muscular, and nervous systems; and describe the differences between cats and humans in these systems; 3. identify cells and tissue types using compound microscopes and photomicrographs; 4. identify the major organs and their associated structures of the integumentary, skeletal, muscular, and nervous systems using models, specimens, and diagrams; 5. demonstrate appropriate use and care of the microscope; and 6. demonstrate basic dissection techniques and laboratory safety. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI125: Human Anatomy and Physiology II	During or by the end of the course students will be able to (as evaluated through written quizzes, tests, and exams): 1. identify the components and subcomponents of the endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems; 2. recognize the functional relationships within and among the sensory, endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems in maintaining homeostasis; 3. recognize and interpret the relationships between chemistry and physiology as they relate to cellular and sub-cellular processes; such as vision, olfaction, taste, and hearing, hormone action, antigen-antibody reactions, heart function, lung function, nutrition, metabolism and temperature regulation, and fluid, electrolyte and acid-base balance; 4. apply basic knowledge of anatomy and physiology to demonstrate the complementarity of structure and function when the body exhibits homeostasis and during pathological deviations from homeostasis; 5. apply basic knowledge of metabolic pathways and their links to energy production and storage to the function of the respiratory, digestive, and urinary systems; and 6. recognize the detailed roles that the nervous and endocrine systems play in coordinating and integrating the function of the human body. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

BI125L: Human Anatomy and Physiology II Laboratory	During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams): 1. record, analyze, and interpret data from computer-simulated laboratory exercises on endocrine system physiology, blood analysis, cardiovascular dynamics, cardiovascular physiology, respiratory system mechanics, chemical and physical processes of digestion, renal system physiology and acid-base balance; 2. dissect, differentiate, locate, and identify on a cat components and subcomponents of the endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary, and reproductive systems; and describe the differences between cats and humans in these systems; 3. identify the major organs and their associated structures of the sensory, endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems using slides, models, specimens, photomicrographs, and diagrams; 4. describe the pathway of blood through the heart, urine through the kidneys, food through the digestive system, and egg and sperm through the reproductive system (through fertilization); and 5. demonstrate basic dissection techniques and laboratory safety. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI157: Principles of Biology I	1. Define and apply scientific terms related to evolution, taxonomy, phylogeny, plate tectonics, basic chemistry, the cell, embryology and immunology; 2. Utilize lab techniques of microscopy and dissection to observe and characterize biological materials; and 3. Apply writing and quantitative skills to prepare a scientific paper (lab report) using data from measurements of the growth of corn and bean seeds, including graphing. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI157L: Principles of Biology I Laboratory	1. Define scientific terms related to evolution, taxonomy, phylogeny, plate tectonics, basic chemistry, the cell, embryology and immunology; 2. Utilize lab techniques of microscopy and dissection to observe and characterize biological materials; and 3. Apply writing and quantitative skills to prepare a scientific paper (lab report) using data from measurements of the growth of corn and bean seeds, including graphing. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI158: Principles of Biology II	1. Identify processes of photosynthesis, respiration, plant and animal physiology, behavior and ecology, and characterize the steps of processes in an organized manner; 2. Utilize lab techniques of experimentation, microscopy and dissection to characterize processes & structures involved in 1., above; and 3. Apply writing and quantitative skills to produce, with a partner, a scientific paper (ecology report) utilizing information obtained by observations and/or experimentation in the field, and present this paper as a class seminar using posters, power point

	and/or other forms of communication. 4. Implement quantitative skills for introductory genetics, e.g., diagram crosses, ratios of genotypes and phenotypes, calculate Chi Square and determine degrees of freedom and probability. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI158L: Principles of Biology II Laboratory	1. Identify processes of photosynthesis, respiration, plant and animal physiology, behavior and ecology, and characterize the steps of processes in an organized manner; 2. Utilize lab techniques of experimentation, microscopy and dissection to characterize processes & structures involved in 1., above; and 3. Apply writing and quantitative skills to produce, with a partner, a scientific paper (ecology report) utilizing information obtained by observations and/or experimentation in the field, and present this paper as a class seminar using posters, power point and/or other forms of communication. 4. Implement quantitative skills for introductory genetics, e.g., diagram crosses, ratios of genotypes and phenotypes, calculate Chi Square and determine degrees of freedom and probability. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI201: Natural History of Guam	**PENDING FACULTY INPUT**
BI212: Oceanography	During or by the end of the course students will be able to: 1. Demonstrate knowledge about major geological, physical, chemical, and biological features and processes in the oceans. 2. Describe examples of major processes, such as seafloor spreading, El Nino, upwelling, tidal fluctuations, where they occur in the oceans geographically and why they are important. 3. Interpret and use common representations of ocean features (maps, graphs, diagrams of the sea floor, the water column, the sea surface, etc.). 4. Evaluate significant ocean and coastal problems that impact public policy debates. 5. Identify and critically appraise the scientific content of relevant media discussions of oceanographic issues, particularly along the Oregon coast. 6. Develop a greater appreciation for ocean management, conservation, and protection, globally. 7. Understand the nature, value, and limitations of scientific methods at sea and on shore (this will be discussed in lecture and experienced firsthand in lab). **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI212L: Oceanography Laboratory	During or by the end of the course students will be able to: 1. Demonstrate knowledge about major geological, physical, chemical, and biological features and processes in the oceans. 2. Describe examples of major processes, such as seafloor spreading, El Nino, upwelling, tidal fluctuations, where they occur in the oceans geographically and why

	they are important. 3. Interpret and use common representations of ocean features (maps, graphs, diagrams of the sea floor, the water column, the sea surface, etc.). 4. Evaluate significant ocean and coastal problems that impact public policy debates. 5. Identify and critically appraise the scientific content of relevant media discussions of oceanographic issues, particularly along the Oregon coast. 6. Develop a greater appreciation for ocean management, conservation, and protection, globally. 7. Understand the nature, value, and limitations of scientific methods at sea and on shore (this will be discussed in lecture and experienced firsthand in lab). **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI225: Basic Microbiology	The students will be given opportunities to demonstrate whether they learned anything by their scores on tests and quizzes of the following: **1. Microbial cell biology** ●Information flow within a cell ●Regulation of cellular activities ●Cellular structure and function ●Growth and division ●Cell energy metabolism **2. Microbial genetics** ●Inheritance of genetic information ●Cause, consequences and uses of mutations ●Exchange and acquisition of genetic information **3. Interactions and impact of microorganisms and humans** ●Host defense mechanisms ●Microbial pathogenicity mechanisms ●Disease transmission ●Antibiotics and chemotherapy ●Genetic engineering ●Biotechnology **4. Interactions and impact of microorganisms in the environment** ●Adaptation and natural selection ●Symbiosis ●Microbial recycling of resources ●Microbes transforming environment **5. Integrating Themes** ●Microbial evolution ●Microbial diversity **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the

	above Program Faculty approved SLOs.
BI225L: Basic Microbiology Laboratory	During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams) demonstrate the ability to: **1. Use a bright field light microscope** to view and interpret slides, including ●Correctly setting up and focusing the microscope ●Proper handling, cleaning, and storage of the microscope ●Correct use of all lenses ●Recording microscopic observations **2. Properly prepare slides** for microbiological examination, including ●Cleaning and disposing of slides ●Preparing smears from solid and liquid cultures ●Performing wet mount and/or hanging drop preparations ●Performing Gram stains **3. Properly use aseptic techniques** for the transfer and handling of microorganisms and instruments, including ●Sterilizing and maintaining sterility of transfer instruments ●Performing aseptic transfer ●Obtaining microbial samples **4. Use appropriate microbiological media and test systems,** including ●Isolating colonies and/or plaques ● Maintaining pure cultures **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI302: Plant Diversity	1. Identify unknown plants to the taxonomic level appropriate for that group and be able to say why. 2. Know the higher taxonomic groups and their characteristics and be able to compare and contrast them. 3. Use characteristics of organisms and higher taxa to assess the systematic placement of taxa. 4. Use criteria to identify specimens, and work with differing classification schemes and the criteria and philosophy that underlie them. 5. Use the principles of microscopy to select appropriate illumination and other settings on the microscopes in use to consistently obtain good images, and to solve problems with poor images. In learning about biodiversity students will focus particular attention on comparative morphology and life cycles. This is not a course in species identification, though students will learn names for representative organisms and some others. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

BI302L: Plant Diversity Laboratory	1. Identify unknown plants to the taxonomic level appropriate for that group and be able to say why. 2. Know the higher taxonomic groups and their characteristics and be able to compare and contrast them. 3. Use characteristics of organisms and higher taxa to assess the systematic placement of taxa. 4. Use criteria to identify specimens, and work with differing classification schemes and the criteria and philosophy that underlie them. 5. Use the principles of microscopy to select appropriate illumination and other settings on the microscopes in use to consistently obtain good images, and to solve problems with poor images. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI303: Animal Diversity	1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected animal phyla; 2. Utilize techniques of microscopy and dissection to observe and characterize animal structures and functions; and 3. Compare and contrast animal structures in relation to evolutionary aspects. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI303L: Animal Diversity Laboratory	1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected animal phyla; 2. Utilize techniques of microscopy and dissection to observe and characterize animal structures and functions; and 3. Compare and contrast animal structures in relation to evolutionary aspects. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI310: Evolution	1. Define the differences between the theory of evolution by natural selection and alternative explanations. 2. Calculate the divergence times of species using a molecular clock. 3. Differentiate between the concepts of environmental modification, adaptation, and pre-adaptation. 4. Construct a phylogeny using the methods of phylogenetic systematics. 5. Calculate the relative influences of individual genetic differences and environmental influences on the phenotypes in a population sample. 6. Write a critique of a brief scientific paper, e.g., from *Nature* e.g., Are the methods appropriate for the hypothesis or research question? Do the data support the hypothesis? What are key and hidden assumptions, conflicting viewpoints? **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI315: General Genetics	1. Determine the mode of inheritance of various traits using a pedigree. 2. Outline the chemical structure of DNA and RNA.

	3. Differentiate between the mechanisms of DNA replication, transcription, and translation. 4. Measure the degree of genetic polymorphism among individuals in a population using modern laboratory methods, e.g., PCR to obtain data for population genetic models. 5. Apply bacterial transformation, viral transduction, and bacterial conjugation to modify laboratory strains of bacteria. 6. Solve problems in molecular and population genetics, including designing experimental protocols with relevant statistical analyses. 7. Compare your team's results with that of other groups to troubleshoot and improve experimental protocols. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI315L: General Genetics Laboratory	1. Determine the mode of inheritance of various traits using a pedigree. 2. Outline the chemical structure of DNA and RNA. 3. Differentiate between the mechanisms of DNA replication, transcription, and translation. 4. Measure the degree of genetic polymorphism among individuals in a population using modern laboratory methods. 5. Apply bacterial transformation, viral transduction, and bacterial conjugation to modify laboratory strains of bacteria. 6. Solve problems in molecular and population genetics, including designing experimental protocols with relevant statistical analyses. 7. Compare your team's results with that of other groups to troubleshoot and improve experimental protocols. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI320: Biodiversity Photomicroscopy	1. Write and present a structurally correct draft journal article, poster slide and oral talk on their biodiversity research, following the "IMRAD" formula, using the appropriate discourse genres for each section of the report, including—effective photodocumentation, graphics software (Photoshop) and hardware (photomicroscope, scanner, digital camera for stills and brief videos), presentation software (Power Point), advanced word-processing features (MS Word), and spreadsheets (Excel) to construct, tables, graphs and diagrams and incorporate them into reports. 2. Apply criteria to discriminate among ethically correct and effective ways of presenting data. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI321: Scientific Arguments	1. Apply various "lenses" to analyze the structure of passages, i.e. critical thinking, ETS GRE rubrics for the issue and analysis essays, reasoning fallacies. 2. Write an effective argument and a presentation abstract. 3. Write an effective statement of purpose of graduate school and a simple grant proposal.

	Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI333: Comparative Vertebrate Anatomy	1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected vertebrate animals; 2. Utilize techniques of microscopy and dissection to observe and characterize vertebrate structures and functions; and 3. Compare and contrast characteristic vertebrate structures, in lab and lecture, in relation to evolutionary aspects. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI333L: Comparative Vertebrate Anatomy Laboratory	1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected vertebrate animals; 2. Utilize techniques of microscopy and dissection to observe and characterize vertebrate structures and functions; and 3. Compare and contrast characteristic vertebrate structures, in lab and lecture, in relation to evolutionary aspects. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI/AG345: General Entomology	**See AG345 in Agriculture SLOs-CMs**
BI/AN360: Human Osteology	**PENDING FACULTY INPUT**
BI365: Taxonomy of Vascular Plants	1. Define and apply terms used for vascular plant evolution, phylogeny and morphology; 2. Use this information to present, orally & with demonstration materials, plant families and examples; 3. Collect and properly curate local plant specimens and identify them taxonomically using references and university herbarium specimens; and 4. Utilize this information to identify specimens on lab practicals. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI365L: Taxonomy of Vascular Plants Laboratory	1. Define terms used for vascular plant evolution, phylogeny and morphology; 2. Use this information to present, orally & with demonstration materials, plant families and examples; 3. Collect and properly curate local plant specimens and identify them taxonomically using references and university herbarium specimens; and 4. Utilize this information to identify specimens on lab practicals. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI 392: Laboratory Teaching and Assisting	**PENDING FACULTY INPUT**
BI/PY 405: Animal Behavior	**PENDING FACULTY INPUT**
BI/PY 405L: Animal Behavior Laboratory	**PENDING FACULTY INPUT**
BI 410: Ecology	1. Apply ecosystem concepts such as symbiosis, food chains and webs, physical & biological limiting factors, element cycles and energy flow, etc.;

	2. Utilize field techniques and quantitative skills to measurement of ecological variables, e.g. gather population ecology data and test e.g., water temperature, hardness, pH and salinity. Prepare data compilations using graphs, tables, and other scientific figures for processes involved in 1., above; and 3. Apply writing skills to produce, (4 with partners and independently), five scientific papers resembling environmental impact assessments of specific local ecosystems, using information obtained from field work, techniques of 1 & 2, above, and from scientific literature. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI 412: Biometrics	During or by the course end the student will: 1. Define mathematical terms related to statistics and probability theory as it is applied in biology; 2. Use a computer scripting language to write programmers of inferential statistical tests; and 3. Design biological experiments based on a sound statistical basis. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI 412L: Biometrics Laboratory	During or by the course end the student will: 1. Define mathematical terms related to statistics and probability theory as it is applied in biology; 2. Use a computer scripting language to write programmers of inferential statistical tests; and 3. Design biological experiments based on a sound statistical basis. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI 416: Cellular Physiology	1. To define and describe fundamental concepts in the functioning of the cell 2. To define the relationship between molecular structure and cellular function 3. To define the dynamic character of cellular organelles 4. To define the use of chemical energy in running cellular activities and ensuring accurate macromolecular biosynthesis 5. To define the unity and diversity at the macromolecular and cellular levels 6. To define and elaborate the mechanisms that regulate cellular activities 7. To learn and apply mathematical equations, where appropriate, in understanding cellular functions. 8. To elaborate the key experimental approaches and research methodologies that allow conclusions to be made in investigating cellular function. 9. To elaborate on the human perspective in investigating cellular function by describing the disruption of activities at the cellular and molecular level that leads to disease. 10. To describe the importance of basic research as the pathway to understanding and eventually treating most human disorders.

	Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI 416L: Cellular Physiology Laboratory	1. To learn to launch a scientific investigation in understanding the cell, the basic unit of life. 2. To learn the concept and preparation of biological buffers 3. To learn the use of oil immersion light microscopy and phase contrast microscopy, to examine prokaryotic (bacteria) and eukaryotic (yeast, human) cells 4. To learn basic microbiological procedures for culturing bacterial and yeast cells used routinely in gene cloning. 5. To learn the preparation of Drosophila polytene chromosome squashes in order to understand the concepts of chromatin and gene replication and expression. 6. To learn the use of differential stains to identify the key biological macromolecules, DNA, RNA, and Proteins present in polytene chromosomes. 7. To learn the fundamental concept of "recombinant DNA technology" and its usefulness in investigating cellular physiology To learn identification, isolation, and manipulation of cellular macromolecules (genomic DNA, plasmid DNA, RNA, Proteins). 9. To learn the use of instrumentation like the UV/Visible Spectrophotometer, DNA & protein gel electrophoresis apparatus, Table-top Centrifuges, UV transilluminator, and Electroporator to introduce DNA into host cells. 10. To learn to construct a human genomic library construction project and screen for isolation of genes. 11. To learn gene expression & control, performing experiments using the E.coli arabinose operon as a model system. 12. To learn the key immunological concept of antigen-antibody reaction using diffusion agar plates and in preparation for theoretical aspects of immunology presented in the lecture class. 13. To learn to interact with fellow students and take responsibility for their part in the group work conducted in the laboratory. 14. To learn to write a detailed laboratory report in the form of a research publication on a molecular cell project conducted in the laboratory. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI/CH 419: Biochemistry	1. To learn the fundamental language of biochemistry, the major classes of biomolecules and the molecular logic of life. 2. To learn the structure and function of proteins and the latest methods and instrumentation used to analyze them. 3. To learn the importance of understanding the 3-D structure of proteins and the complex problem of protein folding and implications for neurodegenerative diseases. 4. To learn the structure and function of enzymes and the mechanism of enzyme catalysis and enzyme regulation in both health and disease. 5. To learn the approaches and instrumentation employed in the emerging field of Proteomics paralleling the Genomics revolution. 6. To learn the basic principles of bioenergetics. 7. To learn the fundamentals and of metabolism and its regulation. 8. To learn the cellular generation of the chemical energy required for sustaining life. 9. To learn the fundamentals of the complex balance of the physical, chemical, and biological context in which each biomolecule, reaction, or pathway operates and the relationship

	between structure and function. 10. To learn applications of biochemistry to problems in medicine, dentistry, agriculture, forensics, anthropology, environmental sciences, and other fields. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI/CH 419L: Biochemistry Laboratory	1. To learn the fundamentals of biochemistry laboratory science, including laboratory safety; scientific notation; significant figures in calculations; errors in experiments; accuracy *vs.* precision; international system of measurements; expressing concentrations of biochemical solutions; preparing dilutions; use of pipets and pipetman; analysis and interpretation of experimental data, and presentation of experimental data by preparing data tables, and graphs by hand and computer. 2. To perform titration experiments to learn the acid-base behavior of amino acids. 3. To conduct experiments in photometry and the use of both UV & visible spectrophotometer. 4. To perform, with the use of the Spectrophotometer, a series of experiments on enzyme kinetics and enzyme regulation & inhibition. 5. To perform experiments in *in vivo* biochemistry, integrating genetics with biochemistry in order to learn the biochemical basis and approaches that are undertaken to explain genetic processes. 6. To learn molecular biochemical approaches to purify and characterize proteins, essential to investigating cellular and organismal physiology. 7. To learn two high tech instrumentation (HPLC and GC-MS), useful for biochemical analysis. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI 425/G: Molecular Biology	1. To learn the fundamental and new concepts in understanding the structure and function of DNA, RNA, and Protein and gene regulation and the basis for the phrase "Genomics to Proteomics". 2. To learn the fundamental concepts of molecular medicine and the latest information on the molecular biological basis of health and disease. 3. To learn breakthrough developments in novel molecular approaches and instrumentation for the detection and treatment of diseases. 4. To learn research information on a wide variety of bio-medical topics including, stem cell research, cardiovascular biology, neurobiology, viral infection, cancer biology, and immunology. 5. To analytically examine research publications, that investigate a specific disease and learn approaches and experiments that have been conducted, to explain the molecular basis of the defect. 6. To learn the use of standard and novel molecular approaches and latest instrumentation in investigating disease. 7. To evaluate the success and failures of the scientific investigation reported in selected research publications and speculate on the future prospects for finding a cure for the disease. 8. To learn, when appropriate, historical perspectives, news and views and ethical

	considerations of topics in molecular medicine. 9. To learn to apply molecular biology approaches to solve biomedical research questions and construct molecular models to explain biological phenomena. 10. To examine and comment on video clips of key cellular events taken using "Video Microscopy" by various researchers in the field of molecular cell biology, in order to obtain glimpses of the fascinating processes that govern the living cell. 11. To learn the use of Kinemage (kinetic image) illustrations of biomolecules as an interactive computer display. Students will learn the main feature, interactive rotations to help visualize objects in 3-D in order to allow better communication of ideas that depend on 3-dimensional information. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI 425/G/L: Molecular Biology Laboratory	1. To learn to launch specific scientific research investigations in the field of molecular biology and its application in biomedicine. 2. To learn to initiate a research project and take it to completion, presenting final reports for projects. 3. To prepare and present posters on projects undertaken in the laboratory course work, at the University of Guam College-Wide CLASS Annual Conference, in order to learn verbal and written scientific communicative skills and to learn to collaborate on a research project. 4. To learn the commitment and challenges a scientist experiences, the importance of collaboration with fellow scientists, and the importance of taking responsibility for their part in the project. 5. To learn the use of computer technology in molecular biology research and to access a variety of molecular biology tools and databases available on various free web sites on the internet for the analysis of genes and protein 3-D structure & function, and for drug discovery. 6. To learn the physical principles of phase, fluorescence & confocal microscopy. 7. To learn preparation of slides of a eukaryotic cells and the use of special fluorescent dyes and the technique of Immunofluorescence Microscopy to detect and localize biomolecules. 8. To learn to perform and the usefulness of introduce foreign genes into host cells, expressing the genes and purifying and fundamental characterization of the proteins coded by the genes using molecular approaches and instrumentation. 9. To learn gene identification, manipulation, and isolation using a combination of various molecular biology approaches and techniques. 10. To initiate a project on human oncogenes, coding for transcription factors

	and also implicated in cancer. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
BI/AG 430: Scientific Photography	**See AG430 in Agriculture SLOs-CMs**
BI 440: Ichthyology	**PENDING FACULTY INPUT**
BI 440L: Ichthyology Laboratory	**PENDING FACULTY INPUT**
BI 474: Marine Botany	1. Identify at sight the common seaweeds to genus, and in some cases to species. 2. Interpret technical descriptions of seaweeds for adequate use of keys to identify specimens to genus level. 3. Draw accurate interpretive diagrams of specimens. 4. Use criteria in dichotomous keys to benthic algae. 5. Prepare benthic algae for study (sectioning, mounting, clearing, etc. as appropriate). 6. Recognize reproductive and vegetative structures and use these in identification. 7. Describe the roles and importance of algae in tropical marine ecosystems. 8. Use a research photomicroscope of examining and documenting algal specimens with a variety of illumination (phase contrast, DIC, fluorescence).I 9. Ability to conduct field surveys and data analysis to assess algal diversity and abundance. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.