

# BIOLOGY B.S. WITH A CONCENTRATION IN ECOLOGY

## Program Learning Outcomes

VU Biology graduates should be able to:

1. **Demonstrate** proficiency in *general biology concepts and theories*, as well as in self-selected biology sub-disciplines in order to succeed in careers and graduate programs.
2. **Illustrate** sufficient proficiency in *calculus, general chemistry, organic chemistry, and physics* in order to understand biological concepts involving these disciplines.
3. **Operate** basic *scientific instruments* necessary for biological investigations such as microscopes, centrifuges, spectrophotometers, electrophoresis equipment and pH meters thus demonstrating competency in *basic laboratory skills*, cell culture, and field techniques.
4. **Design** and conduct experiments –both individually and in small groups– using appropriate strategies such as: *collect, organize, analyze, interpret, and present quantitative & qualitative data and incorporate* them into the broader context of biological knowledge.
5. **Analyze and evaluate** various types of *scientific information* including primary research articles, mass media sources and world-wide web information.
6. **Disseminate** and *present biological data* with theoretical and historical perspectives –both in oral and written formats– to a diverse audience.
7. **Use critical and creative thinking to solve problems** by compiling and analyzing scientific information from library, electronic, and experimental sources. Effectively apply current technology and scientific methodologies for problem solving.
8. **Articulate** historical, current, and theoretical issues relating to biology and society within a Christ-centered worldview that allows for *evaluation of the relationship of scientific theories with ethical and religious perspectives*, particularly those common to Pentecostal Christians.

## Requirements

Code	Title	Units
	Core Curriculum Requirements ( <a href="https://catalog.vanguard.edu/interdisciplinary-offerings/core-curriculum/">https://catalog.vanguard.edu/interdisciplinary-offerings/core-curriculum/</a> )	46
	Biology Major Core Requirements	53
	Concentration in Ecology Requirements	23
	General Electives	0
	<b>Total Units</b>	<b>122</b>

### Biology Major Requirements

Code	Title	Units
	<b>Lower Division:</b>	
BIOL-111 & 111L	Principles of Cell and Molecular Biology and Principles of Biology Lab, Principles of Cell/ Molecular Biology Lab	4

BIOL-112 & 112L	Principles of Organismal Biology and Principles of Organismal Biology Lab	4
BIOL-220 & 220L	Cell Biology and Cell Biology Lab	4
CHEM-120 & 120L	General Chemistry I and General Chemistry I Lab	4
CHEM-121 & 121L	General Chemistry II and General Chemistry II Lab	4
MATH-180C	Calculus I	4
MATH-265C	Intro to Statistical Methods	3
PSCI-223C & 223CL	Mechanics of Solids and Fluids and Mechanics of Solids and Fluids Lab	4
or PSCI-130C & 130CL	General Physics I and General Physics I Lab	
PSCI-225 & 225L	Electricity and Magnetism and Electricity and Magnetism Lab	4
or PSCI-131 & 131L	General Physics II and General Physics II Lab	

### Upper Division:

BIOL-309 & 309L	Microbiology and Microbiology Laboratory	4
BIOL-311 & 311L	Genetics and Genetics Laboratory	4
BIOL-315 & 315L	General Ecology and Ecology Field and Lab Practicum	4
BIOL-499C	Capstone Seminar in Biology	2
CHEM-304 & 304L	Organic Chemistry I and Organic Chemistry Techniques I	4

**Total Units** 53

## Concentration in Ecology

Code	Title	Units
BIOL-345C	Mountain Field Biology	4
BIOL-346C	Desert Field Ecology	4
BIOL-366 & 366L	Plant Ecology and Plant Ecology Lab	4
BIOL-456	Principles of Conservation Biology	3
BIOL-450	UG Research or Internship Program	2
or BIOL-485	Undergrad Biological Research	
or BIOL-488	Biology Senior Project	
	Choose six units from the following courses:	6
BIOL-302 & 302L	Comparative Vertebrate Anatomy and Comp Vertebrate Anatomy Lab	
BIOL-304 & 304L	Human Physiology and Human Physiology Lab	
BIOL-348C	Coastal Ecology	
BIOL-470	Special Topic in Biology	
ENVR-305 & 305L	Intro to Soil Sciences and Intro to Soil Sciences Lab	
ENVR-405	Intro to Geo Info System (GIS)	



Students may choose up to 3 courses from Au Sable Institute summer program. Students can choose courses related to interest: animal, marine, plant.

**Total Units** **23**

## Four Year Plan

**Disclaimer:** This *sample Four Year Plan* is provided as a guide for the recommended sequencing of courses. Vanguard University requires that students complete a minimum of 120 units of required course work as outlined on the Requirements tab in order to receive a bachelor's degree. It is the student's responsibility to confirm with the department the course rotation before enrolling in courses. Questions, contact the Department of Biological Sciences.

**Study Abroad Participation:** Students interested in participating in the university's Study Abroad programs are encouraged to reach out to the Global Education and Outreach Office (studyabroad@vanguard.edu) for more information and collaboration in their academic course planning. Students using Education and Training Benefits through the U.S. Department of Veteran Affairs are encouraged to also reach out to the School Certifying Official (veteranscertifyingofficial@vanguard.edu) for more information regarding how benefits can be applied.

Course	Title	Units
<b>Year 1 Term 1</b>		
BIOL-111	Principles of Cell and Molecular Biology	3
BIOL-111L	Principles of Biology Lab, Principles of Cell/ Molecular Biology Lab	1
CHEM-120	General Chemistry I	3
CHEM-120L	General Chemistry I Lab	1
CORE-100C	Cornerstone	1
NT-101C	New Testament Survey	3
ENGL-120C	Persuasive Writing	3
<b>Units</b>		<b>15</b>
<b>Year 1 Term 2</b>		
BIOL-112	Principles of Organismal Biology	3
BIOL-112L	Principles of Organismal Biology Lab	1
CHEM-121	General Chemistry II	3
CHEM-121L	General Chemistry II Lab	1
MATH-180C	Calculus 1	4
PSYC-103C	Introduction to Psychology	3
<b>Units</b>		<b>15</b>
<b>Year 2 Term 1</b>		
BIOL-220	Cell Biology	3
BIOL-220L	Cell Biology Lab	1
ENGL-220C	Researched Writing	3
COMM-201C	Speech Composition and Presentation	3
THEO-101C	Foundations of Christian Life	3
KINE-148C	Lifetime Fitness and Wellness Lecture	3
<b>Units</b>		<b>16</b>
<b>Year 2 Term 2</b>		
BIOL-311	Genetics	3

BIOL-311L	Genetics Laboratory	1
FINA-PLCR	Fine Arts Core Curriculum Requirement	3
OT-201C	Old Testament Survey	3
BIOL-315L	Ecology Field and Lab Practicum	1
BIOL-315	General Ecology	3
BIOL-STATS	Statistics Option	3

**Units** **17**

### Year 3 Term 1

PSCI-PLGP1	Physics 1 Requirement	4
CHEM-304	Organic Chemistry I	3
CHEM-304L	Organic Chemistry Techniques I	1
BIOL-309	Microbiology	3
BIOL-309L	Microbiology Laboratory	1
BIOL-366	Plant Ecology	3
BIOL-366L	Plant Ecology Lab	1

**Units** **16**

### Year 3 Term 2

PSCI-PLGP2	Physics 2 Requirement	4
SOC-100C	Introduction to Sociology	3
HIST-PLHD	History Core Requirement	3
BIOL-346C	Desert Field Ecology	4

**Units** **14**

### Year 4 Term 1

BIOL-345C	Mountain Field Biology	4
HIST-PLCR2	History Core Requirement (World Civ)	3
THEO-300C	Developing a Christian World View	3
BIOL-485	Undergrad Biological Research	1-4
BIOL-ECOLE	BIOL/ENVR Elective	3-4

**Units** **14-18**

### Year 4 Term 2

CHIS-400C	Christian Heritage	3
ENGL-230C	Literature and the Human Experience	3
BIOL-456	Principles of Conservation Biology	3
BIOL-499C	Capstone Seminar in Biology	2
BIOL-ECOLE	BIOL/ENVR Elective	3-4

**Units** **14-15**

**Total Units** **121-126**

