

## **Operational Plan for Biology Program**

### **Section A**

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**Associated Faculty:**

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### **Welcome to Biology!**

The biology major prepares students for careers in medical professions, food and quality control, pharmaceuticals, the environmental field, biological research, and more. Biology is a growing field with new breakthroughs in genomics, medicine, molecular biology, and biotechnology. Our faculty are committed to facilitating the advance of our students to the highest levels of knowledge and technical skills so that they may make a significant contribution in their chosen field, and to honor the Creator in their vocations.

Greenville University's biology major demands a comprehensive exposure to the entire field yet allows the flexibility to emphasize each student's particular interest and career goals. Recent graduates have gone on to graduate studies in botany, molecular genetics, and other fields of biology. Others have entered competitive professional school programs in medicine, dentistry, physical therapy, and veterinary medicine.

Our faculty are committed to providing an academic learning environment that allows students to thrive and grow into highly competent professionals. Our faculty take a personal interest in all our students, both in and out of the classroom and we work with each student to develop their career plans. In fact, over the years 2008-2018, 85 - 90% of our students who applied to Medical School were admitted.

### **Program Mission Statement**

The Department of Biology is committed to excellence. Our mission is two-fold. First, preparing graduates in the biological sciences who demonstrate open-minded inquiry, integrity, service, and stewardship of God's creation. Our graduates will understand the study and practice of biology can be an expression of Christian faith. Second, helping students in the liberal arts better understand and appreciate their role in God's created order. We see this commitment as an affirmation of the mission of Greenville University.

### **Programmatic Faith Integration**

In the biology department, our students are encouraged to explore the ethical and moral implications of biological science and are challenged to respond to these issues in a thoughtful and Christ-like manner. This may include developing a Christian ethical framework for a research topic in biology to reflecting on the theological issues raised by genetic diseases. Faculty endeavor to model thoughtful Christian engagement with issues of relevance in the field of Biology.

## Section B

**Program/Major Objectives:** *Qualities and competencies expected in graduates from this program/major*

At the close of their degree, students should be able to:

1. Think like a biologist
  1. Demonstrate working knowledge of major areas of biology as identified in the biology major (cellular/molecular, anatomical, ecology).
  2. Describe ethical dimensions of biological issues and articulate links between the study of biology and a Christian worldview.
2. Work like a biologist
  1. Design studies, collect and analyze data to answer biological questions
  2. Appropriately utilize scientific literature
  3. Demonstrate standard laboratory skills
3. Communicate like a biologist
  1. Orally present scientific information effectively
  2. Communicate scientific information in written form effectively

### **Biology's Fulfillment of the SLOs**

Students demonstrate knowledge and skill (SLO 2) in the Biology major as they build a working knowledge of major areas of biology (PO 1.1), as they collect, analyze and interpret data (PO 2.2), and as they utilize the scientific literature to refine and answer questions.

Students demonstrate effective communication skills (SLO 4) in the Biology major as they accurately communicate scientific information in both written and oral form (PO 3.1, 3.2). Biology students' character and application of Christian virtues (SLO 6) is demonstrated by their ability to engage relevant issues in Biology on an ethical and moral basis, as well as their ability to articulate links between the study of biology and a Christian worldview.

### **Biology's Connections to Greenville University as a Whole**

The biology major has two major interactions with the GU general education curriculum. The first is that there are key foundations for biology majors that are built on elements of the Gen Ed curriculum. Examples include writing, and particularly the documentation of use of information sources (ENGL 105), quantitative skills (MATH 106 or higher). In addition, the foundation of THEO 110, BIBL 205/215 and UNIV 301 are very important in helping Biology majors develop the ability to describe ethical dimensions of biological issues and articulate links between the study of biology and a Christian worldview (PO 1.2, SLO 6).

A second major interaction is that biology provides a substantial number of Gen Ed lab science courses that serve students I other majors. In most years biology would provide a Gen Ed lab science course for around 150 students (3-4 sections per year of Health and Nutrition (BIOL 105OL), as well as (in alternating years) BIOL 108, BIOL 115, BIOL 145, and BIOL 155.

Section C

Program Learning Objectives	Required Courses / Learning Opportunities										Elective Courses/Learning Opportunities									
	110	112	CHEM 111	CHEM 112	305	360	370	UNIV 301	302	410	105	150	245	246	346	347	340	333	395	330
1.1	I		I	I	D		M				I		I	I	D	D				D
1.2						I		D		M		I						M	D	D
2.1	I	I			D		D		D	M										D
2.2	I		I	I						M	I	I						D		D
2.3	I	D	I	D	M	M	M						D	D	M	M	M			
3.1					D	D				M							D	D		
3.2		I			D	D			D	M							D			D

Key: I = Introduced D = Developed M = Mastered

## Section D

SLOs	Program Objective	Level of Mastery (IDM)	Term	Course number	Learning Activity	Bench -mark	Assessment method
<b>Year One</b>							
SLO 2	1.1	I	Fall/Spring	110	Exams	>70%	Average of exam scores
		D	Fall	370	Exams, Labs	>65%	Average of exams 2 & 3 and Labs
		M	Investigate feasibility of ETS major field test in biology as an assessment.				
SLO 6	1.2	I	Any	THEO 110	Introduced at I level in Gen Ed Curriculum		
		D	Fall/Spring	UNIV 301	Term Paper	>70%	Term paper grade
		M	Fall/Spring	410	Faith/Ethics Paper	>70%	Faith/Ethics paper grade
<b>Year Two</b>							
SLO 2	2.1	I	Spring	112	Independent Experiment	>70%	Experimental Proposal Grade
		D	Fall	370	Lab Project	>70%	varies
		M	Fall/Spring	410	Research Paper Components	>75%	Introduction and Data Use grades
SLO 2	2.2	I	Spring	112	Primary Literature	>70%	Primary literature assignment grade
		D	Fall	370	Primary Literature	>70%	Primary literature assignment grade
		M	Fall/Spring	410	Research Paper	>75%	Lietearture Use grade
<b>Year Three</b>							
SLO 2	2.3	I	Fall/Spring	110	Labs and Practical Exams	>70	Average of Lab Skills Grades
		D	Spring	112	Labs and Practical Exams	>70	Average of Lab Skills Grades
		M	Fall	360	Labs and Practical Exams	>70	Average of Lab Skills Grades
		M	Fall	370	Labs and Practical Exams	>70	Average of Lab Skills Grades
		M	Spring	305	Labs and Practical Exams	>70	Average of Lab Skills Grades
<b>Year Three</b>							
SLO 4	3.1	I	Any	UNIV 101	Introduced at I level in Gen Ed Curriculum		
		D	Spring	305	Molec. Techniques Presentation	>70%	Oral presentation score
		M	Fall/Spring	410	Long Presentation	>70%	Long Presentation score
SLO 4	3.2	I	Spring	112	Independent Experiment Report	>70%	Written Report Grade
		D	Fall	360	Unknowns Lab Reports	>70%	Average of Unknowns reports 1&2
		M	Fall/Spring	410	Review Article	>70%	Final Paper score

## Description of Assessment Processes

Program Objective	Introducing	Developing	Mastering
1.1. Think like a biologist: Demonstrate working knowledge of major areas of biology as identified in the biology major (cellular/molecular, anatomical, ecology).	BIOL110; Exams	BIOL305; Sum of COs 1-3, Mendelian Genetics Lab assignment; Fundamental Concepts Exam Questions	ETS Biology Exam or Alternate
1.2. Think like a biologist: Describe ethical dimensions of biological issues and articulate links between the study of biology and a Christian worldview.	BIOL360 Antibiotics Exam	UNIV301: Term paper or mid-term	BIOL410 CLO Faith/Ethics reflection paper
2.1. Work like a biologist: Design studies, collect and analyze data to answer biological questions	BIOL112; Independent Experiment Proposal	BIOL370; Lab Project	BIOL410 Paper Introduction and Data Use grades
2.2. Work like a biologist: Appropriately utilize scientific literature	BIOL110 Labs 1-5	BIOL370; Primary Literature	BIOL410; Literature Use grade
2.3. Work like a biologist: Competently utilize standard laboratory or field techniques	BIOL 110; Labs and Practicals	BIOL 112; Labs and Practicals	BIOL 305, BIOL 360, BIOL 370; Labs and Practicals
3.1. Communicate like a biologist: Orally present scientific information effectively	UNIV 101	BIOL 305 Oral presentation on molecular biology techniques	BIOL410; Presentations
3.2. Communicate like a biologist: Communicate scientific information in written form effectively	BIOL112; Independent Experiment Proposal	BIOL360 Unknown Lab Reports 1 & 2	BIOL410; Writing Grade

The table above shows that assessment of program learning objectives is intentionally based on a variety of assignments, including exams, lab reports, oral presentations, and writing assignments, in order to better gauge student learning.

At the “Introducing” level, BIOL 110 and BIOL 112 are heavily utilized for assessment, as they are the first courses in the major taken before other courses in the program. Currently, PO 1.1, 2.1, 2.2, 2.3 and 3.2 are assessed on items from the BIOL 110/112 sequence.

At the “Developing” level, most assessment data will come from the biology core courses (BIOL 305: Genetics; BIOL 360: Microbiology; and BIOL 370: Ecology). In addition, UNIV 301: Science and Christianity is an important source of assessment data for PO 1.2

At the “Mastering” level, BIOL 410 (Senior Seminar) is the main source of assessment data, with five separate grade items assessing mastery of different course objectives.

There are currently several gaps in the assessment plan:

PO 3.1 is currently not assessed at the “I” level. If Bio faculty continue to teach a section of UNIV 101, this could be assessed in UNIV 101. It could also be included in BIOL 110/112 curriculum (most likely in the lab, as the number of students would be smaller, reducing stress for students presenting). Alternately, PO 3.1 and 3.2 may be collapsed into a single objective focused on communication.

PO 1.1 is currently not assessed at the “M” level. Given the nature of PO 1.1, we are investigating the use of a biology-specific nationally normed exam, though it is very likely that this will cost-prohibitive.

### **Assessment Timetable**

The departmental faculty meet approximately monthly throughout the academic year, and these meetings generally include discussion of observations and anecdotal information about course effectiveness and progress on program objectives.

At the end of every semester, the program coordinator will circulate the curriculum map among the program faculty to collect the relevant student learning data. The program coordinator will compile the end of term assessment report for the relevant program objectives and share it with program faculty.



At the end of every semester, the faculty convene a two-hour meeting in which faculty observations and anecdotal information gathered and discussed through the semester are compiled along with all of the outcome data from the program's courses. These are discussed. The faculty try to determine whether any deficiencies seen in the data are related to program curriculum, and if so, what changes are needed to correct deficiencies, and when those changes should be made. These changes may be changes in the curriculum, or changes in objectives or assessment.

The department will assess the three major program objectives on a four-year rotating schedule. While we may not limit course and curriculum adjustments to the major objective being assessed in a given year, we will intentionally focus on one area each academic year. PO 1: Think like a biologist (2019-2020); PO 2.2&2.2: Work like a biologist (2020-2021); PO 2.3: Work like a biologist (Lab Skills (2021-2022): PO 3: Communicate like a biologist (2022-2023).