

# DEPARTMENT OF BIOLOGY

The Department of Biology offers the following undergraduate degree programs:

**BS in Biology**

**BS in Biology with an emphasis in genetics**

**BS in Medical Biology**

## **Biology Major**

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Lander's degree program in biology provides comprehensive training in the life sciences. The curriculum is based on the Core Concepts and Core Competencies put forth in AAAS' *Vision and Change in Undergraduate Biology Education*. Students complete coursework geared toward mastering the five core concepts of biology: 1) evolution; 2) structure and function; 3) information flow, exchange, and storage; 4) pathways and transformations of energy and matter; and 5) systems. Through laboratory, research, and classroom experiences, students also accrue six core competencies that demonstrate their ability to 1) apply the process of science; 2) use quantitative reasoning; 3) use modeling and simulation; 4) tap into the interdisciplinary nature of science; 5) communicate and collaborate within and outside the discipline; and 6) understand the relationship between science and society.

The core concepts will be addressed in the required courses and reinforced in the elective courses. To ensure thorough exposure to all the core concepts, students enroll in a suite of courses mapped to each of the core concepts by choosing from course groups based on the core concepts. Group 1 courses emphasize structure and function; Group 2 courses emphasize information flow, exchange, and storage; and Group 3 courses emphasize systems and the pathways and transformations of energy and matter. All courses taught in each of these groups include coverage of relevant evolutionary concepts and help students gain experience toward mastery of the core competencies described above.

The core requirements for a degree in Biology are BIOL 111, BIOL 112, BIOL 299, BIOL 303, BIOL 312, BIOL 399, and BIOL 499. Further additional requirements include BIOL 213 or BIOL 214, one course from each of three concept groups (Group 1 – BIOL 308, BIOL 313, or BIOL 401; Group 2 – BIOL 307, BIOL 403, or BIOL 422; Group 3 – BIOL 306, BIOL 311, BIOL 415, or BIOL 421), and 8 hours of elective biology courses. At least 4 hours of the elective biology coursework must be at the 300-level or above. All biology majors must successfully complete CHEM 111, CHEM 112, and CHEM 221. A maximum of 4 hours of biology research may count toward elective hours for the biology degree.

For students anticipating secondary school teaching or seeking admission to professional or graduate school, CHEM 222, CHEM 301, PHYS 201, and PHYS 202 are strongly recommended and may be required.

A minimum grade of "C" must be earned in all biology courses counted toward the BS in Biology. A minimum grade of "C" must be earned in all biology and medical biology courses counted toward the BS in Medical Biology. In addition, a minimum cumulative GPA of 2.0 must be earned for all major program requirements (including CHEM courses).

## **Pre-Professional Curricula**

Lander's biology department offers curriculum plans in the following areas: pre-medicine, pre-dentistry, pre-optometry, pre-veterinary medicine, pre-pharmacy, pre-physical therapy, pre-occupational therapy, and pre-physician assistant.

The goals of these curriculum plans are to:

1. provide a well-respected and rigorous core curriculum that will make students who are applying to professional schools highly competitive;
2. offer the full variety of courses that are required or recommended for acceptance into most professional schools; and
3. help students navigate the application procedures and timelines specific to their professional-school goals.

## **Biology Degree with Emphasis in Genetics**

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The genetics emphasis is designed for students interested in research careers in genetics or biomedical science. Beginning with the solid foundation in biological sciences provided by the standard BS in biology, this program includes additional coursework and experiences in biochemistry, animal development, and genetics. All students in

the emphasis will complete a laboratory research project in genetics, the results of which will be presented in a public seminar.

### **Medical Biology Major**

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Students completing the BS in Medical Biology will be prepared to enter competitive post-graduate programs in health care such as Medicine, Osteopathic Medicine, Physical Therapy, Physician Assistant/Associate, Optometry, Dentistry, and all other allied health programs. In addition, graduates will be prepared to enter graduate programs in genetics, physiology, microbiology and immunology, or cellular and molecular biology. Upon graduation, students will also be able to enter the work force in various laboratory and data analysis fields.

The core of the program's curriculum is based on the traditional sciences including biology, chemistry, mathematics, physics, and social sciences. In addition, students will be engaged in upper-level electives that focus on human health and disease and are given the opportunity to earn clinical credentials in various health care fields. A four-part series of seminar courses focuses on helping students become proficient at reading and critically analyzing scientific literature and health care studies, networking within their field, and preparing application materials for professional or graduate schools.

The BS in Medical Biology program has entrance requirements and grade point average (GPA) benchmarks that need to be maintained in order to earn a degree:

First-year students must meet two of three criteria:

1. A minimum high school GPA of 3.0 on the Universal Grading Scale,
2. A minimum SAT score of 1100 (ACT 24), or
3. Graduate in the top 30% of their high school class.

Second-year students must have completed 16 hours of science courses and have a minimum science GPA of 3.0. These qualifications can include summer coursework. Students from other majors that meet these criteria can enter the medical biology program at the beginning of their second year.

Third-year students must have completed 28 hours of science courses and have a minimum science GPA of 3.25. Students from other majors that meet these criteria can enter the program at the beginning of their third year. Students that are in the Medical Biology program at the beginning of the third year will be eligible to complete the program once they meet all the degree requirements. Students who have not reached the benchmark requirements for the Medical Biology program before the beginning of their second and third years will not be able complete the program and will be converted to the biology major unless a different major is preferred. A minimum grade of "C" must be earned in all medical biology (BIOM) or Biology (BIOL) courses counted toward the BS in Medical Biology. In addition, a minimum cumulative GPA of 2.0 must be earned for all major program requirements.

Transfer students should declare the biology major and then may enter the medical biology major after taking at least 8 hours of science courses at Lander and having a minimum science GPA of 3.00. These students must also have a minimum science GPA of 3.25 at the point where a total of 33 or more hours of science coursework have been completed. These requirements are consistent with the minimum science GPA requirements for students entering the medical biology major as a first-time freshman.

### **Biology Minor**

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A minor in biology includes BIOL 111, BIOL 112, either BIOL 213 or BIOL 214, and at least 7 additional hours of 300- or 400-level biology courses. Advisors and prospective minors should note that most biology courses have prerequisites and/or co-requisites that must be met. A grade of "C" or better is required in all biology courses taken for the minor.

### **Graduation with Honors**

Students majoring in biology or medical biology will qualify for a BS with Honors in Biology or Honors in Medical Biology if the following requirements are met:

1. Completion and submission to the department chair of an Application for Graduation with Honors in Biology with at least three semesters remaining before graduation.
2. Successful completion of the program for the BS in Biology, the BS in Biology with an emphasis in genetics, or the BS in Medical Biology;
3. Completion of an additional 5 hours of biology or medical biology coursework at the 300-level or above that includes at least one four-hour course (BIOL 407-BIOL 412 are not applicable);

4. Cumulative grade point average of 3.5 in all biology or medical biology courses;
5. Cumulative overall grade point average of 3.5 or better; and
6. Completion of a laboratory or field research project in which:
  - a) The research proposal is approved by a majority of the biology faculty. (*This would normally occur in the fall semester of the junior year.*)
  - b) The research is of sufficient quality to justify a total of four credit hours (BIOL 407, BIOL 408, BIOL 409, BIOL 410, or BIOL 412) which are required.
  - c) The research results are presented as follows:
    - 1) by public seminar at Lander University and
    - 2) at an external scientific meeting and/or by submission of a paper for publication in an appropriate scientific journal.

Transfer students may graduate with a BS with Honors if they fulfill the above requirements and have a 3.5 GPA overall and in biology from their former institution(s) and complete their last 60 hours, including at least 20 hours of biology, at Lander University

### Course Offerings by Semester

It is the student's responsibility to be knowledgeable of the schedule of offerings and to plan carefully so that all requirements for the degree can be fulfilled by the desired graduation date. Required courses for the biology degree are normally offered according to the following schedule:

<u>Fall and Spring</u>	<u>Fall Only</u>	<u>Spring Only</u>
BIOL 202	BIOL 111	BIOL 112
BIOL 203	BIOL 213	BIOL 214
BIOL 204	BIOL 304	BIOL 299
BIOL 303	BIOL 307	BIOL 306
BIOL 312	BIOL 308	BIOL 313
BIOL 499	BIOL 311	BIOL 401
BIOL 421*	BIOL 399	BIOL 403
	BIOL 415	BIOM 199
	BIOM 111	BIOM 299
	BIOM 320	BIOM 399
	CHEM 221	BIOM 499
		CHEM 301

\*The final fall offering of BIOL 421 will be the Fall of 2024

## 2024-2025 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: BIOLOGY**

Credit Hours

### GENERAL EDUCATION REQUIREMENTS

(For approved courses see General Education: [www.lander.edu/gen-ed](http://www.lander.edu/gen-ed).)

<b>A. Core Skills</b> (9 hours)	3
ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
MATH 121: Mathematical Applications or	3
MATH 123: Calculus and Its Applications or	3
MATH 141: Single Variable Calculus I	4
<b>B. Humanities and Fine Arts</b>	6
(6 hours selected from 2 different disciplines)	
<b>C. Behavioral and Social Perspectives</b>	6
(6 hours selected from 2 different disciplines)	
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
<b>D. Scientific and Mathematical Reasoning</b>	4
CHEM 111: General Chemistry	4
MATH 211: Statistical Methods I	3
<b>E. Founding Documents of the United States</b>	3
HIST 111R: United States History to 1877 or	
HIST 112R: United States History since 1877 or	
POLS 101R: American National Government	
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
<b>F. World Cultures</b>	3
<b>G. LINK 101: Leadership, Involvement, Networking and Knowledge</b>	1
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.	
<b>TOTAL GENERAL EDUCATION REQUIREMENTS</b>	<b>35</b>

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

### MAJOR PROGRAM CORE REQUIREMENTS

BIOL 111: Foundations in Ecology, Evolution, and Genetics	4
BIOL 112: Foundations in Cellular and Molecular Biology	4
BIOL 299: Sophomore Seminar in Biology	1
BIOL 303: Evolution	3
BIOL 312: Genetics	4
BIOL 399: Junior Seminar in Biology	1
BIOL 499: Senior Seminar in Biology	1

## MAJOR PROGRAM ADDITIONAL REQUIREMENTS

<b>A. Organismal Diversity</b>	4
(Choose 4 credit hours from the following)	
BIOL 213: Botany	
BIOL 214: Zoology	
<b>B. Biology Group I: Structure and Function</b>	4
(Choose 4 credit hours from the following)	
BIOL 308: Comparative Vertebrate Anatomy	
BIOL 313: Plant Anatomy	
BIOL 401: Cell Biology	
<b>C. Biology Group II: Biological Information Flow</b>	4
(Choose 4 credit hours from the following)	
BIOL 307: Animal Development	
BIOL 403: Molecular Biology	
BIOL 422: Immunology	
<b>D. Biology Group III: Systems Biology</b>	4
(Choose 4 credit hours from the following)	
BIOL 306: Ecology	
BIOL 311: Animal Physiology	
BIOL 415: Limnology	
BIOL 421: General Microbiology	
<b>E. Other Requirements</b>	
CHEM 112: General Chemistry	4
CHEM 221: Organic Chemistry	4

## MAJOR PROGRAM ELECTIVES

BIOL 200-level or above (except BIOL 490 and BIOL 498)	4
BIOL 300-level or above (except BIOL 490 and BIOL 498)	4
<b>TOTAL MAJOR PROGRAM REQUIREMENTS</b>	<b>50</b>

**ADDITIONAL ELECTIVES** 35

**TOTAL FOR BS DEGREE** 120

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses.

<https://www.lander.edu/academics/registrar-office/major-guides.html>

## 2024-2025 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: BIOLOGY**  
**EMPHASIS: GENETICS**

Credit Hours

### GENERAL EDUCATION REQUIREMENTS

(For approved courses see General Education: [www.lander.edu/gen-ed](http://www.lander.edu/gen-ed).)

<b>A. Core Skills (9 hours)</b>	3
ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
MATH 121: Mathematical Applications or	3
MATH 123: Calculus and Its Applications or	3
MATH 141: Single Variable Calculus I	4
<b>B. Humanities and Fine Arts</b>	6
(6 hours selected from 2 different disciplines)	
<b>C. Behavioral and Social Perspectives</b>	6
(6 hours selected from 2 different disciplines)	
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
<b>D. Scientific and Mathematical Reasoning</b>	4
CHEM 111: General Chemistry	4
MATH 211: Statistical Methods I	3
<b>E. Founding Documents of the United States</b>	3
HIST 111R: United States History to 1877 or	
HIST 112R: United States History since 1877 or	
POLS 101R: American National Government	
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
<b>F. World Cultures</b>	3
<b>G. LINK 101: Leadership, Involvement, Networking and Knowledge</b>	1
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.	
<b>TOTAL GENERAL EDUCATION REQUIREMENTS</b>	<b>35</b>

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

### MAJOR PROGRAM CORE REQUIREMENTS

BIOL 111: Foundations in Ecology, Evolution, and Genetics	4
BIOL 112: Foundations in Cellular and Molecular Biology	4
BIOL 299: Sophomore Seminar in Biology	1
BIOL 303: Evolution	3
BIOL 312: Genetics	4
BIOL 399: Junior Seminar in Biology	1
BIOL 499: Senior Seminar in Biology	1

## MAJOR PROGRAM ADDITIONAL REQUIREMENTS

<b>A. Organismal Diversity</b>	4
(choose 4 credit hours from the following)	
BIOL 213: Botany	
BIOL 214: Zoology	
<b>B. Group I: Structure and Function</b>	4
(choose 4 credit hours from the following)	
BIOL 308: Comparative Vertebrate Anatomy	
BIOL 313: Plant Anatomy	
BIOL 401: Cell Biology	
<b>C. Group II: Biological Information Flow</b>	4
BIOL 307: Animal Development	
<b>D. Group III: Systems Biology</b>	4
(choose 4 credit hours from the following)	
BIOL 306: Ecology	
BIOL 311: Animal Physiology	
BIOL 415: Limnology	
BIOL 421: General Microbiology	
<b>E. Other Requirements</b>	
BIOL 403: Molecular Biology	4
BIOL 412: Genetics Research	4
BIOL 413: Advanced Genetics	4
BIOL 498: Genetics Seminar	1
CHEM 112: General Chemistry	4
CHEM 221: Organic Chemistry	4
CHEM 301: Biochemistry	3
<b>TOTAL MAJOR PROGRAM REQUIREMENTS</b>	<b>58</b>
<b>ADDITIONAL ELECTIVES</b>	<b>27</b>
<b>TOTAL FOR BS DEGREE</b>	<b>120</b>

Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses.  
<https://www.lander.edu/academics/registrars-office/major-guides.html>

## 2024-2025 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: MEDICAL BIOLOGY**

Credit Hours

### GENERAL EDUCATION REQUIREMENTS

(For approved courses see General Education: [www.lander.edu/gen-ed](http://www.lander.edu/gen-ed).)

<b>A. Core Academic Skills (9 hours)</b>	
ENGL 101: Writing and Inquiry I	3
ENGL 102: Writing and Inquiry II	3
MATH 121: Math for Bus, Life Science or MATH 123: Calculus and its Applications or MATH 141: Single Variable Calculus I	3
<b>B. Humanities and Fine Arts</b>	
(6 hours selected from 2 different disciplines)	
PHIL 302: Ethics	3
Humanities and Fine Arts	3
<b>C. Behavioral and Social Perspectives</b>	
PSYC 101: General Psychology	3
SOC 101: Introduction to Sociology	3
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
<b>D. Scientific and Mathematical Reasoning</b>	
CHEM 111: General Chemistry I	4
MATH 211: Introduction to Statistical Methods I	3
<b>E. Founding Documents of the United States</b>	
HIST 111R: United States History to 1877 or HIST 112R: United States History since 1877 or POLS 101R: American National Government	3
<i>If you already have credit for HIST 111, do not take HIST 111R; if you already have credit for HIST 112, do not take HIST 112R; if you already have credit for POLS 101, do not take POLS 101R.</i>	
<b>F. World Cultures</b>	
	3
<b>G. LINK 101: Leadership, Involvement, Networking and Knowledge</b>	
	1
LINK 101 is required of all new transfer students who have earned less than 24 credit hours of college-level work and all first-time freshmen.	
<b>TOTAL GENERAL EDUCATION REQUIREMENTS</b>	<b>35</b>

If all of the General Education requirements are met and/or waived, and the credit hours do not add up to at least 30, the General Education requirements are not complete. If below 30, additional General Education courses from any category must be taken until the total hours add up to at least 30 hours.

### MAJOR PROGRAM CORE REQUIREMENTS

BIOL 112: Foundations in Cellular and Molecular Biology	4
BIOL 202: Human Anatomy	4
BIOL 203: Human Physiology	4
BIOL 304: Pathophysiology	3
BIOL 312: Genetics	4
BIOL 421: General Microbiology	4



BIOL 401: Cell Biology	4
BIOM 111: Foundations in Human Evolution, Genetics, and Homeostasis	4
BIOM 199: Freshman Seminar in Medical Biology	1
BIOM 299: Sophomore Seminar in Medical Biology	1
BIOM 320: Biomedical Statistics	3
BIOM 399: Junior Seminar in Medical Biology	1
BIOM 499: Senior Capstone Seminar in Medical Biology	1
CHEM 221: Organic Chemistry I	4
CHEM 301: Biochemistry	3

**MAJOR PROGRAM ADDITIONAL REQUIREMENTS**

CHEM 112: General Chemistry II	4
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**MAJOR PROGRAM ELECTIVES**

BIOL or BIOM 300-level or above	7
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TOTAL MAJOR PROGRAM REQUIREMENTS	56
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**ADDITIONAL ELECTIVES**

29

TOTAL FOR BS DEGREE	120
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Coursework must include at least 30 credit hours earned at 300-level or above, of which 12 credit hours must be in the major.

See 4-year major guides for recommended order in which to take courses.

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