

BIOLOGY (BS)



This program was approved for students entering the university in the Summer 2019–Spring 2020 catalog year. For more information about catalog year, go to Catalog Year Information (<http://catalog.louisville.edu/undergraduate/university-wide-unit-specific-policies/catalog-year>).

Bachelor of Science in Biology

Unit: College of Arts and Sciences (AS) (<http://www.louisville.edu/a-s>)
Departmental Website: Biology (<http://www.louisville.edu/a-s/biology>)
Academic Plan Codes: See Track Requirements tab.

Program Information

There are two undergraduate degree programs offered in the Biology Department, a Bachelor of Arts (BA) in Biology and a Bachelor of Science (BS) in Biology.

Bachelor of Science degrees are designed so that students get a particularly strong background in their area of interest in biology, cell/physiology, or ecology, but still have some flexibility to take courses of interest. Compared to the BA degree, the BS degree requires more science, both in biology and in another field (physics or geosciences), a specific calculus course, and one less course in a foreign language.

Each of the tracks in the BS degree also requires courses specific to the field of interest. BS degrees are valuable for students wanting to find employment in a biological field without further formal education, for students planning to attend graduate or professional school, and for students who hope to become teachers.

Completion of this degree requires work to be submitted for the department's Learning Outcomes Measurement. For details, email the department.

Degree Summary

Code	Title	Hours
	General Education Requirements (http://catalog.louisville.edu/undergraduate/general-education-requirements) ¹	31
	(10 hours of General Education requirements may be satisfied through coursework required by the degree program)	
	College/School Requirements	13-15
	Program/Major Requirements ¹	47
	Track Requirements	38-40
	Minimum Total Hours	121

¹ Some courses required in this degree program may satisfy multiple requirements. To complete the degree in the **minimum number of hours** listed, some hours from the General Education Requirements must be satisfied by courses defined by the unit and/or program. Using other courses to satisfy General Education requirements will require additional hours to complete the degree requirements. See the Degree Requirements and Track tabs for specific coursework.

Specific coursework information can be found on the Degree Requirements tab.

Accelerated BA-BS/MS in Biology

Students who wish to pursue an accelerated non-thesis master's degree in Biology (BA-BS/MS) will be allowed to apply up to nine (9) hours of coursework taken for graduate credit while enrolled as an undergraduate. An additional twenty-four (24) hours of graduate coursework will constitute the minimum number of credit hours for obtaining the non-thesis masters in the accelerated program.

Students should apply in their junior year

For more information, please see this website (<http://louisville.edu/biology/undergraduate/accelerated-masters-degree>).

Early Start Program (with the College of Education and Human Development)

The Master of Arts in Teaching program in conjunction with the undergraduate programs in Chemistry, Biology, and Mathematics offers a comprehensive and professionally-focused program leading to an additional degree of MAT Middle or Secondary Education. This early start program enables superior students to receive two degrees within five years. A total of 148 credits are required for the dual degrees: 121 credits of coursework devoted toward the baccalaureate degree and 36 credits toward the MAT, with nine hours double-counted. This program will be available for students who are entering their junior year. They may take graduate level courses in the College of Education and Human Development (CEHD) in their 4th year of study.

The current qualifications for the joint degree program have been agreed upon by discipline faculty from the Colleges of Arts and Sciences and Education and Human Development. The criteria vary by discipline. Students enrolling in the accelerated program will be non-thesis students and must adhere to all policies pertaining to Graduate Students. All interested students must submit an application to the College of Education and Human Development (CEHD) MAT program and meet the admission criteria.

Departmental Admission Requirements

Admission to the Bachelor of Science in Biology requires the following:

- Completion of BIOL 240, BIOL 242, and BIOL 244 with a grade of C or better.
- Completion of MATH 111 with a grade of C or better OR placement into a mathematics course above the level of MATH 111 on the basis of either the University of Louisville mathematics placement examination or ACT/SAT score.
- A minimum overall grade point average (GPA) of 2.0.

The Application for Major form can be found on the Arts & Sciences Advising Center website (<http://louisville.edu/artsandsciences/advising/apply>).

General Education Requirements

Code	Title	Hours
General Education Requirements (http://catalog.louisville.edu/undergraduate/general-education-requirements)*		31

The following courses are required by the program and can satisfy the respective General Education Requirement:

BIOL 240	Unity of Life - S	
or BIOL 242	Diversity of Life - S	
BIOL 244	Principles of Biology Laboratory - SL	
MATH 205	Calculus I - QR	
CHEM 201	General Chemistry I - S	

*All degrees require the completion of the University-wide General Education Program (link provided above). To complete the degree in the **minimum number of hours** listed on the Overview tab, some hours from the General Education Requirements must be satisfied by courses defined by the unit and/or program. If additional hours taken within the program also satisfy General Education requirements, students may need to take additional electives to satisfy the minimum hours required for the degree.

College/School Requirements

Code	Title	Hours
Arts & Sciences Requirements		
GEN 100	Student Success Center Orientation	1
or GEN 101	Arts and Sciences Orientation	
Foreign Language ¹		6-8
Electives in Humanities or Social Sciences at the 300-level or above ²		6
WR - two approved courses at the 300 level or above ³		
Minimum Total Hours		13-15

Program/Major Requirements

Code	Title	Hours
Department of Biology ⁴		
BIOL 240	Unity of Life - S ⁵	3
BIOL 242	Diversity of Life - S ⁵	3
BIOL 244	Principles of Biology Laboratory - SL ⁵	2
BIOL 329	Cellular and Molecular Biology	3
BIOL 330	Genetics and Molecular Biology	3
BIOL 331	Genetics and Molecular Biology: Laboratory	2
BIOL 363	Principles of Ecology	3
BIOL 409	Evolutionary Biology - CUE	3
Supporting Courses		
MATH 205	Calculus I - QR ⁵	4
BIOL 350	Biostatistics (or advisor-approved statistics course)	3
CHEM 201	General Chemistry I - S ⁵	3
CHEM 202	General Chemistry II - S	3
CHEM 207 & CHEM 208	Introduction to Chemical Analysis I - SL Introduction to Chemical Analysis II - SL	2

CHEM 209	Introduction to Chemical Analysis III	1
CHEM 341	Organic Chemistry I	3
CHEM 343	Organic Chemistry Laboratory I	2
PHYS 221 & PHYS 223	Fundamentals of Physics I - S Fundamentals of Physics Lab I - SL	4
Completion of one of the tracks (see Track Requirements tab)		38-40
Minimum Total Hours		85-87

Only 60 hours in the major department may be applied toward the Bachelor of Science Degree.

At least 50 of the total minimum hours required must be at the 300 level or above.

Code	Title	Hours
Culminating Undergraduate Experience (Graduation requirement)		
Requirement fulfilled by completing one of the following:		
BIOL 405	Undergraduate Research - CUE ⁶	
BIOL 406	Undergraduate Research (WR) - CUE, WR ⁶	
BIOL 409	Evolutionary Biology - CUE	
BIOL 415	Biology of the Cell - CUE, WR	
BIOL 430	Undergraduate Teaching Assistant - CUE	
BIOL 440	Global Change Ecology - CUE	
BIOL 443	Developmental Biology - CUE, WR	
BIOL 485	Microbial Physiology - CUE, WR	
BIOL 490	Biology Internship - CUE	
BIOL 541	Medicinal Plant Biochemistry - CUE, WR	
BIOL 548	Experimental Design and Analysis - CUE	

- Completion of the second semester of a single foreign language; hours will vary depending on language taken
- In addition to courses counted toward General Education
- May be incorporated into other degree requirements
- Note: BIOL 102, BIOL 104, BIOL 257, BIOL 258, BIOL 260, BIOL 261, BIOL 262 and BIOL 263 do not count toward electives in the major.
- Fulfills General Education requirement.
- A maximum of 6 hours of undergraduate research or independent study may count toward the major.

BS in Biology Tracks

Track in Molecular, Cellular, and Developmental Biology

Academic Plan Code(s): BIOLBS_MCD

Code	Title	Hours
Supporting Courses		
CHEM 342 & CHEM 344	Organic Chemistry II Organic Chemistry Laboratory II	5
PHYS 222 & PHYS 224	Fundamentals of Physics II - S Fundamentals of Physics Laboratory II - SL	4
Molecular, Cellular, and Developmental Biology Track Core Courses		
BIOL 357	General Microbiology	3
BIOL 443	Developmental Biology - CUE, WR	3
BIOL 465	Principles of Physiology	3
BIOL 540	Intermediary Metabolism	3
Molecular, Cellular, and Developmental Biology Laboratory Experience		1-4

Select one of the following:

BIOL 358	Microbiology Laboratory
BIOL 404	Undergraduate Research
or BIOL 405	Undergraduate Research - CUE
or BIOL 406	Undergraduate Research (WR) - CUE, WR
BIOL 416	Biotechnology Methods - WR
BIOL 541	Medicinal Plant Biochemistry - CUE, WR
BIOL 548	Experimental Design and Analysis - CUE

Molecular, Cellular, and Developmental Biology Track Electives 9-10

Select at least three courses from the following:

BIOL 347	Comparative Vertebrate Anatomy
BIOL 359	Microbial Genetics and Pathogenesis - WR
BIOL 415	Biology of the Cell - CUE, WR
BIOL 435	Chemical Ecology - WR
BIOL 480	Introduction to Immunology - WR
BIOL 485	Microbial Physiology - CUE, WR
BIOL 511	Behavioral Endocrinology - CUE, WR
BIOL 512	Endocrinology
BIOL 515	Environmental Physiology
BIOL 542	Gene Structure and Function - WR
BIOL 552	Evolutionary Medicine
BIOL 553	Chronic Disease Biology

Biology Electives (300 level or higher) 5-7

Minimum Total Hours 38-40

Track in Ecology

Academic Plan Code(s): BIOLBS_ECO

Code Title Hours

Supporting Courses

Select two of the following courses: 5-6

GEOS 301	Geology for Scientists and Engineers
GEOG 355	Introduction to Remote Sensing
GEOS 363	Climate Science
GEOS 365	Biogeography
GEOS 367	Geomorphology
GEOG 558	Introduction to Geographic Information Systems
SUST 518	Urban Demography and GIS

Select one of the following two sequences: 4-5

PHYS 222	Fundamentals of Physics II - S
& PHYS 224	Fundamentals of Physics Laboratory II - SL
CHEM 342	Organic Chemistry II
& CHEM 344	Organic Chemistry Laboratory II

Ecology Track Core Courses

BIOL 401	Advanced Ecology	3
BIOL 563	Population and Community Ecology	3

Ecology Track Electives

Select at least one course from each of the following three categories

Plant Ecology 3

BIOL 300	Plant Biology - WR
BIOL 304	Plant Taxonomy & Ecology - WR
BIOL 435	Chemical Ecology - WR

Animal Ecology 3

BIOL 308	Vertebrate Zoology
BIOL 310	Animal Behavior
BIOL 347	Comparative Vertebrate Anatomy
BIOL 382	Entomology
BIOL 510	Behavioral Ecology
BIOL 514	Ornithology
BIOL 515	Environmental Physiology
BIOL 571	Selected Topics (Invertebrate Zoology)

Community Ecology 3

BIOL 372	Evolutionary Ecology of Disease
BIOL 440	Global Change Ecology - CUE
BIOL 560	Ecology of Urban and Suburban Landscapes
BIOL 562	Ecosystems Ecology
BIOL 567	Conservation Biology

Select one additional courses from any of the three categories above 3

Biology electives at the 300 level or above 11

Minimum Total Hours 38-40

Flight Plan

Track in Molecular, Cellular, and Developmental Biology

Course	Title	Hours
Year 1		
Fall		
GEN 100 or GEN 101	Student Success Center Orientation or Arts and Sciences Orientation	1
BIOL 240	Unity of Life - S ¹	3
CHEM 201 & CHEM 207 & CHEM 208	General Chemistry I - S Introduction to Chemical Analysis I - SL Introduction to Chemical Analysis II - SL	5
Foreign Language 1 ²		3-4
ENGL 101	Introduction to College Writing - WC	3
	Hours	15-16
Spring		
BIOL 242	Diversity of Life - S ¹	3
BIOL 244	Principles of Biology Laboratory - SL ¹	2
CHEM 202 & CHEM 209	General Chemistry II - S Introduction to Chemical Analysis III	4
MATH 205	Calculus I - QR	4
Foreign Language 2 ²		3-4
	Hours	16-17
Year 2		
Fall		
BIOL 329	Cellular and Molecular Biology	3
CHEM 341 & CHEM 343	Organic Chemistry I Organic Chemistry Laboratory I	5
ENGL 102	Intermediate College Writing - WC	3
General Education: Cardinal Core Oral Communication - OC ¹		3
	Hours	14
Spring		
BIOL 330	Genetics and Molecular Biology	3
BIOL 331	Genetics and Molecular Biology: Laboratory	2
CHEM 342 & CHEM 344	Organic Chemistry II Organic Chemistry Laboratory II	5
PHYS 221 & PHYS 223	Fundamentals of Physics I - S Fundamentals of Physics Lab I - SL	4
General Education: Cardinal Core Arts & Humanities Global Diversity - AHD2 ¹		3
	Hours	17

Year 3		
Fall		
BIOL 363	Principles of Ecology	3
BIOL 540	Intermediary Metabolism	3
Select one of the following lab experiences: ³		1-3
BIOL 358	Microbiology Laboratory	
BIOL 404	Undergraduate Research	
BIOL 405	Undergraduate Research - CUE	
BIOL 406	Undergraduate Research (WR) - CUE, WR	
BIOL 416	Biotechnology Methods - WR	
BIOL 541	Medicinal Plant Biochemistry - CUE, WR	
BIOL 548	Experimental Design and Analysis - CUE	
PHYS 222	Fundamentals of Physics II - S	3
PHYS 224	Fundamentals of Physics Laboratory II - SL	1
General Education: Cardinal Core Arts & Humanities -AH ¹		3
Hours		14-16
Spring		
BIOL 465	Principles of Physiology	3
BIOL 350	Biostatistics	3
Biology MCD elective 1 (choose one)		3-4
BIOL 347	Comparative Vertebrate Anatomy	
BIOL 359	Microbial Genetics and Pathogenesis - WR	
BIOL 415	Biology of the Cell - CUE, WR	
BIOL 435	Chemical Ecology - WR	
BIOL 480	Introduction to Immunology - WR	
BIOL 485	Microbial Physiology - CUE, WR	
BIOL 511	Behavioral Endocrinology - CUE, WR	
BIOL 512	Endocrinology	
BIOL 515	Environmental Physiology	
BIOL 542	Gene Structure and Function - WR	
BIOL 552	Evolutionary Medicine	
BIOL 553	Chronic Disease Biology	
Biology elective		3-4
Humanities/Social Science/Biology WR course (300 level or above) ⁴		3
Hours		15-17
Year 4		
Fall		
BIOL 409	Evolutionary Biology - CUE	3
BIOL 357	General Microbiology	3
Biology MCD elective 2 (choose one)		3-4
BIOL 347	Comparative Vertebrate Anatomy	
BIOL 359	Microbial Genetics and Pathogenesis - WR	
BIOL 415	Biology of the Cell - CUE, WR	
BIOL 435	Chemical Ecology - WR	
BIOL 480	Introduction to Immunology - WR	
BIOL 485	Microbial Physiology - CUE, WR	
BIOL 511	Behavioral Endocrinology - CUE, WR	
BIOL 512	Endocrinology	
BIOL 515	Environmental Physiology	
BIOL 542	Gene Structure and Function - WR	
BIOL 552	Evolutionary Medicine	
BIOL 553	Chronic Disease Biology	
Humanities/Social Science/Biology Elective (300 level or above)		3
General Education: Cardinal Core Historical Perspective – SBH ¹		3
Hours		15-16
Spring		
BIOL 443	Developmental Biology - CUE, WR	3
Biology MCD Elective 3 (choose one)		3-4
BIOL 347	Comparative Vertebrate Anatomy	
BIOL 359	Microbial Genetics and Pathogenesis - WR	
BIOL 415	Biology of the Cell - CUE, WR	
BIOL 435	Chemical Ecology - WR	
BIOL 480		
BIOL 485		
BIOL 511		
BIOL 512		
BIOL 515		
BIOL 542		
BIOL 552		
BIOL 553		
Humanities/Social Science/Biology Elective (300 level or above)		3
General Education: Cardinal Core Oral Communication - OC ¹		3
Hours		15-16
Year 1		
Fall		
BIOL 480	Introduction to Immunology - WR	
BIOL 485	Microbial Physiology - CUE, WR	
BIOL 511	Behavioral Endocrinology - CUE, WR	
BIOL 512	Endocrinology	
BIOL 515	Environmental Physiology	
BIOL 542	Gene Structure and Function - WR	
BIOL 552	Evolutionary Medicine	
BIOL 553	Chronic Disease Biology	
Humanities/Social Science/Biology Elective (300 level or above)		3-4
Humanities/Social Science/Biology WR Course (300 level or above) ⁴		3
General Education: Cardinal Core Social & Behavioral Sciences US Diversity - SBD1 ¹		3
Hours		15-17
Minimum Total Hours		121-130

- ¹ Fulfills the requirement for one of two required Gen Ed courses. However, only one Gen Ed course from each program will be counted towards your degree.
- ² Students with high school language experience or multilingual backgrounds should consult the Classical and Modern Languages department for information on partially or completely satisfying the language requirements through testing.
- ³ This is a good time to think about performing undergraduate research. Look at faculty websites here and at the HSC, then email faculty whose research you find interesting. See if they have openings.
- ⁴ Biology WR courses that fit well in this track include: BIOL 359, BIOL 415, BIOL 416, BIOL 480, BIOL 485, BIOL 511, BIOL 541, and BIOL 542 but note that only some of these are offered in a given semester. BIOL 406 (undergraduate research) would be appropriate if you plan to do an honors project, and is also a good source of writing credit. You MUST have mentor approval.

Track in Ecology

Course	Title	Hours
Year 1		
Fall		
GEN 100 or GEN 101	Student Success Center Orientation or Arts and Sciences Orientation	1
BIOL 240	Unity of Life - S ¹	3
CHEM 201 & CHEM 207 & CHEM 208	General Chemistry I - S Introduction to Chemical Analysis I - SL Introduction to Chemical Analysis II - SL ¹	5
Foreign Language 1 ²		3-4
ENGL 101	Introduction to College Writing - WC	3
Hours		15-16
Spring		
BIOL 242	Diversity of Life - S ¹	3
BIOL 244	Principles of Biology Laboratory - SL ¹	2
CHEM 202 & CHEM 209	General Chemistry II - S Introduction to Chemical Analysis III	4
Foreign Language 2 ²		3-4
ENGL 102	Intermediate College Writing - WC	3
Hours		15-16
Year 2		
Fall		
BIOL 329	Cellular and Molecular Biology	3
PHYS 221 & PHYS 223	Fundamentals of Physics I - S Fundamentals of Physics Lab I - SL ¹	4
MATH 205	Calculus I - QR	4
General Education: Cardinal Core Oral Communication - OC ¹		3

General Education: Cardinal Core Social & Behavioral Sciences US Diversity - SBD1 ¹	3
Hours	17
Spring	
BIOL 330 Genetics and Molecular Biology	3
BIOL 331 Genetics and Molecular Biology; Laboratory	2
Choose one of the following	3
CHEM 341 Organic Chemistry I	5
& CHEM 343 Organic Chemistry Laboratory I	
GEOS 301 Geology for Scientists and Engineers	
GEOS 367 Geomorphology	
General Education: Cardinal Core Arts & Humanities Global Diversity - AHD2 ¹	3
Hours	16
Year 3	
Fall	
BIOL 363 Principles of Ecology	3
BIOL 350 Biostatistics	3
Biology Ecology elective 1 ³	3-4
Choose one of the following	4-5
PHYS 222 Fundamentals of Physics II - S	
& PHYS 224 Fundamentals of Physics Laboratory II - SL ¹	
CHEM 342 Organic Chemistry II	
& CHEM 344 Organic Chemistry Laboratory II	
General Education: Cardinal Core Historical Perspective – SBH ¹	3
Hours	16-18
Spring	
BIOL 563 Population and Community Ecology	3
Biology Ecology elective 2 ³	3-4
Biology elective (300 level or above) ⁴	3
Humanities/Social Science/Biology WR Course (300 level or above) ⁵	3
Humanities/Social Science/Biology elective (300 level or above)	3
Hours	15-16
Year 4	
Fall	
BIOL 401 Advanced Ecology	3
BIOL 402 Advanced Ecology Lab	2
BIOL 409 Evolutionary Biology - CUE	3
Biology Ecology elective 3 ³	3
General Education: Cardinal Core Arts & Humanities – AH ¹	3
Hours	14
Spring	
Biology Ecology elective 4 ³	3
Biology elective	3
Biology/Geosciences Elective	3
Choose one of the following	3
GEOG 355 Introduction to Remote Sensing	
GEOS 363 Climate Science	
GEOS 365 Biogeography	
GEOS 367 Geomorphology	
GEOG 558 Introduction to Geographic Information Systems	
SUST 518 Urban Demography and GIS	
Humanities/Social Science/Biology WR Course (300 level or above) ⁵	3
Hours	15
Minimum Total Hours	123-128

¹ Fulfills the requirement for one of two required Gen Ed courses. However, only one Gen Ed course from each program will be counted towards your degree.

² Students with high school language experience or multilingual backgrounds should consult the Classical and Modern Languages department for information on partially or completely satisfying the language requirements through testing.

³ Track-specific Electives (choose 1 from each category and at least 1 additional class from these lists, 12 h):

Category I: Plant Ecology

- BIOL 300 WR – Plant Biology
- BIOL 304 WR – Plant Taxonomy
- BIOL 435 WR – Chemical Ecology

Category II: Animal Ecology

- BIOL 308 – Vertebrate Zoology
- BIOL 310 – Animal Behavior
- BIOL 347 – Comp. Vertebrate Anatomy
- BIOL 382 – Entomology
- BIOL 510 – Animal Behavior
- BIOL 514 – Ornithology
- BIOL 515 – Environmental Physiology
- BIOL 571 – Invertebrate Zoology

Category III: Community Ecology

- BIOL 372 – Evolutionary Ecology and Disease
- BIOL 440 – Global Change
- BIOL 560 – Urban Ecology
- BIOL 562 – Ecosystems Ecology
- BIOL 567 – Conservation Biology

⁴ This is a good time to think about performing undergraduate research. Look at faculty websites here and at the HSC, then email faculty whose research you find interesting. See if they have openings.

⁵ Biology courses often listed as WR that fit well in this track include: BIOL 304, BIOL 404, BIOL 405, BIOL 406, BIOL 415, BIOL 435, BIOL 443 but note that only some of these are offered in a given semester. BIOL 406 WR (undergraduate research) would be appropriate if you plan to do an honors project, and is also a good source of writing credit. You MUST have mentor approval.

Degree Audit Report

Degree Audit reports illustrate how your completed courses fulfill the requirements of your academic plan. What-if reports allow you to compare the courses you have completed in your current academic plan to the courses required in another academic plan. Should you have questions about either report, please consult with your academic advisor.

To create either report:

1. Log into your ULink account.
2. Click on the Student Services tab.
3. Next, click on "View my Academic Advisement Report" to run a Degree Audit report in the Undergraduate Advising area.
4. To create a What-if report, click on "Create a What-if Advisement Report."

Click here to run a Degree Audit report, or create a What-if report. (<https://ulink.louisville.edu>)

Flight Planner

Based on your major, the Flight Planner tool may be available for you to create a personalized Flight Plan. The Flight Planner can be found in the ULink Student Center. Consult with your advisor for assistance with the Flight Planner.