

Biological Sciences (BISC)

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The Department of Biological Sciences offers a supportive training environment across the full spectrum of biology, bridging the disciplines of cell and molecular biology, physiology, development, genetics, molecular systematics, microbiology, neurobiology, ecology, and evolutionary biology. Through course selection both within and outside the department, our students are prepared to enter research and professional training programs (health, secondary education, law, etc.) or enter careers in government and a broad range of businesses that rely on a technology-literate workforce with analytical and problem-solving skills.

For information on advanced degrees in biology, see the Graduate School Catalog (<http://catalog.uark.edu/graduatecatalog/programsofstudy/biologicalsciencesbisc/>).

University and College Requirements for a Bachelor of Science in Biology

In addition to the Fulbright College of Arts and Sciences graduation requirements (see under Degree Completion Program Policy), the following course requirements must be met.

State minimum core (<http://catalog.uark.edu/undergraduatecatalog/gened/stateminimum/>) requirements may vary by individual, based on placement and previous course credit earned. Once all core requirements are met, students may substitute with general electives in consultation with their academic advisor.

State Minimum Core	35
Mathematics	4
MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)	
Statistics	3-4
Choose one statistics (STAT) course from the following:	
MATH 21003 Principles of Statistics (ACTS Equivalency = MATH 2103)	
STAT 28233 Biostatistics	
STAT 30043 Statistical Methods & STAT 30041 and Statistics Methods Laboratory	
Chemistry	19
CHEM 14103 University Chemistry I (ACTS Equivalency = & CHEM 14101CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)	

CHEM 14203 University Chemistry II (ACTS Equivalency = & CHEM 14201CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)

CHEM 36053 Organic Chemistry I & CHEM 36051and Organic Chemistry I Laboratory

CHEM 36203 Organic Chemistry II & CHEM 36201and Organic Chemistry II Laboratory

CHEM 38103 Elements of Biochemistry

Physics 8

Choose one two-semester sequence from the following:

PHYS 20103 College Physics I (ACTS Equivalency = PHYS & PHYS 20101 2014 Lecture) and College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)

PHYS 20203 College Physics II (ACTS Equivalency = PHYS & PHYS 20201 2024 Lecture) and College Physics II Laboratory (ACTS Equivalency = PHYS 2024 Lab)

-or-

PHYS 20304 University Physics I (ACTS Equivalency = PHYS 2034)

PHYS 20404 University Physics II (ACTS Equivalency = PHYS 2044 Lecture)

Philosophy 3

Choose one philosophy (PHIL) course from the following:

PHIL 21003 Introduction to Ethics (ACTS Equivalency = PHIL 1003)

PHIL 22003 Logic (ACTS Equivalency = PHIL 1003)

PHIL 31103 Environmental Ethics

PHIL 42103 Philosophy of Science

Biology 40

BIOL 10104 Biology for Majors (ACTS Equivalency = BIOL 1014 Lecture) ¹

BIOL 25473 Cell Biology

BIOL 23373 General Genetics

BIOL 30473 Evolutionary Biology

BIOL 38773 General Ecology

and a minimum of one lab chosen from the following:

BIOL 25471 Cell Biology Laboratory

BIOL 23371 General Genetics Laboratory

BIOL 38771 General Ecology Laboratory

At least 23 credit hours in biology (BIOL) or biology-related electives, including:

1. At least 18 credit hours in biology (BIOL) courses numbered 3000-level or higher, of which at least 12 credit hours must be numbered 4000-level or higher.

2. At least two lab courses numbered 2000-level or higher. This includes Biology Core labs not previously completed. Courses whose course descriptions explicitly exclude them from counting toward this requirement may not be used. Lab courses may also include BIOL 4807V Special Topics in Biological Sciences and BIOL 4997V Research in Biology Sciences (and their honors equivalents).

3. No more than four credit hours numbered at the 1000-level are permitted. BIOL 10103/BIOL 10101 Principles of Biology/Principles of Biology Laboratory may not apply to this requirement.

4. A biology (BIOL) course that meets the Fulbright College Writing Requirement. This may be satisfied by a) Enrolling in BIOL 4987V Senior Thesis; b) completing a term paper with a grade of a 'B' or higher in a biology (BIOL) course numbered 3000-level or higher on a topic approved by the instructor; or c) Completing an honors thesis. Students may not use a paper written for another BIOL course for BIOL 4987V Senior Thesis.

Note: Biology-related electives that are not taught by the Department of Biological Sciences must be approved by a departmental faculty member using the "Exception Request for Major or Minor Requirements" form.

General Electives	8
Total Hours	120

¹ A student who, after completing BIOL 10103/BIOL 10101 Principles of Biology/Principles of Biology Laboratory with a grade of a 'B' or better in both courses, wishes to substitute BIOL 10103/BIOL 10101 for the required BIOL 10104 Biology for Majors may petition the Department of Biological Sciences to do so. These petitions will be considered on a case by case basis.

Writing Requirement: The college writing requirement for majors in biology may be met by one of the following:

1. Completion of an honors thesis,
2. Completion of a senior thesis (BIOL 4987V) supervised by a faculty member in biological sciences,
3. Completion of a required term paper with a grade of B or above in a BIOL course numbered 3000 or above on a topic approved by the instructor, or
4. Completion of a paper, supervised by a Biological Sciences faculty member, in Special Topics (BIOL 4807V)

Note A student exercising Option 3 or 4 may not use the paper written for that option for credit in BIOL 4987V.

B.S. in Biology Eight-Semester Degree Plan

Students enrolling in the eight-semester degree plan should review the Eight-Semester Degree Completion Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>).

State minimum core requirements may vary by individual, based on placement and previous credit granted. Once all core requirements are met, students may substitute with general electives in consultation with their academic advisor.

First Year	Units	
	Fall	Spring
ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1) ¹	3	
Select one of the following (Satisfies General Education Outcome 2.1): ¹	3-4	

MATH 11003 College Algebra (ACTS Equivalency = MATH 1103)

MATH 12003 Plane Trigonometry (ACTS Equivalency = MATH 1203)

MATH 13004 Precalculus Mathematics (ACTS Equivalency = MATH 1305)

MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)²

BIOL 10104 Biology for Majors (ACTS Equivalency = BIOL 1014 Lecture) (Satisfies General Education Outcome 3.4)¹ 4

CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) 4

& CHEM 14101 University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)

General Electives 0-1

ENGL 10203 Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.1)¹ 3

MATH 12003 Plane Trigonometry (ACTS Equivalency = MATH 1203) (if needed--otherwise take general electives) 3-4

or MATH 13004 Precalculus Mathematics (ACTS Equivalency = MATH 1305)

or MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)

CHEM 14203 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) 4

& CHEM 14201 University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)

State Minimum Core—U.S. History (Satisfies General Education Outcome 3.2, 3.3, and 4.2)¹ 3

General Electives 1-2

Year Total: 15 15

Second Year	Units	
	Fall	Spring
State Minimum Core—Fine Arts (Satisfies General Education Outcome 3.1) ¹	3	
Philosophy (PHIL) requirement	3	
BIOL 25473 Cell Biology (take BIOL 25471 if needed)	3	
CHEM 36053 Organic Chemistry I & CHEM 36051 Organic Chemistry I Laboratory	4	
General Electives	2	
State Minimum Core—Social Science (Satisfies General Education Outcome 4.1) ¹		3
BIOL 23373 General Genetics (take BIOL 23371 if needed)		3
CHEM 36203 Organic Chemistry II & CHEM 36201 Organic Chemistry II Laboratory		4
BIOL Electives		3
General Electives		2
Year Total:	15	15

Third Year	Units	
	Fall	Spring
State Minimum Core—Social Science	3	
CHEM 38103 Elements of Biochemistry	3	
Select one of the following:	4	
PHYS 20103 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 20101 College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)		
PHYS 20304 University Physics I (ACTS Equivalency = PHYS 2034)		
BIOL 30473 Evolutionary Biology	3	
BIOL Electives	3	
MATH 21003 Principles of Statistics (ACTS Equivalency = MATH 2103) or STAT 28233 Biostatistics or STAT 30043/30041 Statistical Methods		3
Select one of the following:		4
PHYS 20203 College Physics II (ACTS Equivalency = PHYS 2024 Lecture) & PHYS 20201 College Physics II Laboratory (ACTS Equivalency = PHYS 2024 Lab)		
PHYS 20404 University Physics II (ACTS Equivalency = PHYS 2044 Lecture)		
BIOL 38773 General Ecology (take BIOL 38771 if needed)	3	
BIOL Electives		5
Year Total:	16	15

Fourth Year	Units	
	Fall	Spring
State Minimum Core—Social Science	3	
BIOL Electives	9	
General Electives	3	
State Minimum Core—Humanities (Satisfies General Education Outcome 5.1) ¹		3
BIOL Electives ((Satisfies General Education Outcomes 1.2 and 6.1) ¹)		3
General Electives		8
Year Total:	15	14

Total Units in Sequence: 120

¹ Students must complete the State Minimum Core (<https://nam11.safelinks.protection.outlook.com/?url=http%3A%2F%2Fcatalog.uark.edu%2Fundergraduatecatalog%2Fgeneral%2Fstateminimum%2F&data=04%7C01%7Cccc003%40uark.edu%7C92f936f375f845bf930708d8e3ec5fa1%7C79c742c4e61c4fa5be89a3cb566a80d1%7C0%7C0%7C067007509951644028245%7C0%7C0%7C637509951644028245%7CUnknown%7C1000&sdata=r35av68n3oEQW9FslqBgmbstnUENpJF7EoP4AD4Bks%3D&reserved=0>) and the requirements of their major(s) as outlined in the Catalog of Studies. These courses also fulfill many, if not all, of the General Education Requirements (<https://nam11.safelinks.protection.outlook.com/?url=http%3A%2F%2Fcatalog.uark.edu%2Fundergraduatecatalog%2Fgeneral%2Fgeneral%2F&data=04%7C01%7Cccc003%40uark.edu%7C92f936f375f845bf930708d8e3ec5fa1%7C79c742c4e61c4fa5be89a3cb566a80d1%7C0%7C0%7C067007509951644028245%7CUnknown%7C1000&sdata=r35av68n3oEQW9FslqBgmbstnUENpJF7EoP4AD4Bks%3D&reserved=0>).

Please visit these pages in the links provided and consult with your academic advisor when making course selections to fulfill these requirements.

Requirements for a B.A. Degree with a Major in Biology:

A minimum of 120 hours is required, including:

- BIOL 1584 Biology for Majors. Majors may substitute another 1000-level BIOL course (BIOL 10503/BIOL 10501 Principles of Zoology or BIOL 10303/BIOL 10301 Plant Biology) for BIOL 10104; a maximum of four 1000-level credits may be applied toward the major. A student who, after completing BIOL 10103/BIOL 10101 Principles of Biology/Lab with a grade of B or better in both courses, wishes to substitute BIOL 10103/BIOL 10101 Principles of Biology for BIOL 10104 may petition the Department of Biological Sciences to do so. These petitions will be considered on a case by case basis for approval.

- An additional 26 hours of biological sciences, including:

a. Biology Core (13 hours):

BIOL 25473	Cell Biology	3
BIOL 23373	General Genetics	3
BIOL 30473	Evolutionary Biology	3
BIOL 38773	General Ecology	3

and a minimum of one hour of Core Laboratory selected from:

BIOL 25471	Cell Biology Laboratory	1
BIOL 23371	General Genetics Laboratory	
BIOL 38771	General Ecology Laboratory	

b. Biology Electives (13 hours): must include at least 9 hours in BIOL courses numbered 3000 or higher and at least one course numbered 2000 or higher with a laboratory. (Laboratory courses also include BIOL 4807V, BIOL 480HV, BIOL 4997V, and BIOL 499HV.)

- Requirements in cognate science and mathematics include:

A.

CHEM 14103	University Chemistry I (ACTS Equivalency =	4
& CHEM 14101	CHEM 1414 Lecture)	
	and University Chemistry I Laboratory (ACTS	
	Equivalency = CHEM 1414 Lab)	

CHEM 14203	University Chemistry II (ACTS Equivalency =	4
& CHEM 14201	CHEM 1424 Lecture)	
	and University Chemistry II Laboratory (ACTS	
	Equivalency = CHEM 1424 Lab)	

Select one of the following: 4-8

CHEM 26103	Organic Physiological Chemistry (ACTS	
& CHEM 26101	Equivalency = CHEM 1224 Lecture)	
	and CHEM 26109 Organic Chemistry Laboratory	
	(ACTS Equivalency = CHEM 1224 Lab)	

CHEM 36053	Organic Chemistry I	
& CHEM 3605	and Organic Chemistry I Laboratory	
& CHEM 3620	and Organic Chemistry II	
& CHEM 3620	and Organic Chemistry II Laboratory	

B.

PHYS 20103 College Physics I (ACTS Equivalency = PHYS 4
& PHYS 20101 2014 Lecture)
and College Physics I Laboratory (ACTS
Equivalency = PHYS 2014 Lab)

PHYS 20203 College Physics II (ACTS Equivalency = PHYS 4
& PHYS 20201 2024 Lecture)
and College Physics II Laboratory (ACTS
Equivalency = PHYS 2024 Lab)

C.

MATH 22003 Survey of Calculus (ACTS Equivalency = MATH 3-4
2203)
or MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)

D.

Select one of the following: 3-4

STAT 28233 Biostatistics

MATH 21003 Principles of Statistics (ACTS Equivalency =
MATH 2103)

STAT 30043 Statistical Methods

MATH 21803 Mathematical Reasoning in a Quantitative World

4. Requirement in Philosophy

Select one of the following: 3

PHIL 21003 Introduction to Ethics (ACTS Equivalency =
PHIL 1003)

PHIL 22003 Logic (ACTS Equivalency = PHIL 1003)

PHIL 31103 Environmental Ethics

PHIL 42103 Philosophy of Science

5. Students must complete a minimum of 20 credit hours at the 3000-level or higher from requirements 2, 3, and 4 listed above or from a combination of requirements 2, 3, and 4 above and from additional 3000-level or higher BIOL upper-level electives.

Writing Requirement: The college writing requirement for majors in biology may be met by one of the following:

1. Completion of an honors thesis,
2. Completion of a senior thesis (BIOL 4987V) supervised by a faculty member in biological sciences,
3. Completion of a required term paper with a grade of B or above in a BIOL course numbered 3000 or above on a topic approved by the instructor, or
4. Completion of a paper, supervised by a Biological Sciences faculty member, in Special Topics (BIOL 4807V)

Note A student exercising Option 3 or 4 may not use the paper written for that option for credit in BIOL 4987V.

Biology B.A.**Eight-Semester Degree Program**

Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) for university requirements of the program. Core requirement hours may vary by individual, based on placement and previous credit granted. Once all core requirements are

met, students may substitute a three-hour (or more) general elective in place of a core area.

	First Year	
	Fall	Units Spring
ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)	3	
Select one of the following (Satisfies General Education Outcome 2.1): ¹	3-4	
MATH 12003 Plane Trigonometry (ACTS Equivalency = MATH 1203)		
MATH 13004 Precalculus Mathematics (ACTS Equivalency = MATH 1305)		
MATH 24004 Calculus I (ACTS Equivalency = MATH 2405) ³		
BIOL 10104 Biology for Majors (ACTS Equivalency = BIOL 1014 Lecture) (Satisfies General Education Outcome 3.4)	4	
Satisfies General Education Outcome 3.4:		
CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 14101 University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)	4	
General Elective	0-1	
ENGL 10203 Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.1)		3
MATH 22003 Survey of Calculus (ACTS Equivalency = MATH 2203) ³ or MATH 24004 Calculus I (ACTS Equivalency = MATH 2405)		3
CHEM 14203 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 14201 University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)		4
Select one of the following (Satisfies General Education Outcome 4.2):		3
HIST 20003 History of the American People to 1877 (ACTS Equivalency = HIST 2113)		
HIST 20103 History of the American People, 1877 to Present (ACTS Equivalency = HIST 2123)		
PLSC 20003 American National Government (ACTS Equivalency = PLSC 2003)		
Fine Arts State Minimum Core (Satisfies General Education Outcome 3.1) ²		3
Year Total:	15	16

	Second Year	
	Fall	Units Spring
BIOL 25473 Cell Biology (BIOL 25471 optional) ³	3	
Select from the following:	4	
CHEM 36053 Organic Chemistry I & CHEM 36051 Organic Chemistry I Laboratory ^{3,4}		

or

BIOL 23373 General Genetics & BIOL 23371 General Genetics Laboratory ³		
State Minimum Core Social Sciences (Satisfies General Education Outcome 3.3) ⁵	3	
State Minimum Core Social Sciences (Satisfies General Education Outcome 3.3)(as needed) or General Elective ⁵	3	
General Elective (Select a course that satisfies General Education Outcome 4.1) ⁶	3	
Select one of the following:	3-4	
BIOL 23373 General Genetics & BIOL 23371 General Genetics Laboratory ³		
Biology elective		
BIOL 30473 Evolutionary Biology ^{3,4}		
Select one of the following:	4	
CHEM 36203 Organic Chemistry II & CHEM 36201 Organic Chemistry II Laboratory ^{3,4}		
CHEM 26103 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) & CHEM 26101 Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab) ³		
Select one of the following:	3	
PHIL 21003 Introduction to Ethics (ACTS Equivalency = PHIL 1003) (Satisfies General Education Outcomes 3.2 and 5.1)		
PHIL 22003 Logic (ACTS Equivalency = PHIL 1003) ³		
PHIL 31103 Environmental Ethics ^{3,4}		
PHIL 42103 Philosophy of Science ^{3,4}		
State Minimum Core Social Sciences (Satisfies General Education Outcome 3.3) ⁵		
State Minimum Core Humanities (Select a course that satisfies both General Education Outcome 3.2 and 5.1) (as needed) or General Elective ⁷	3	
General Elective or Social Sciences State Minimum Core (as needed)	3	
Year Total:	16	16

Third Year	Units	
	Fall	Spring
One of the following:	3-4	
BIOL 30473 Evolutionary Biology ^{3,4}		
BIOL 38773 General Ecology & BIOL 38771 General Ecology Laboratory ^{3,4}		
Biology Elective		
Biology elective	3-4	
PHYS 20103 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 20101 College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab) ³	4	
Select one of the following:	3-4	
STAT 28233 Biostatistics		
MATH 21003 Principles of Statistics (ACTS Equivalency = MATH 2103) ³		

STAT 30043 Statistical Methods & STAT 30041 Statistics Methods Laboratory ^{3,4}		
MATH 21803 Mathematical Reasoning in a Quantitative World ^{3,4}		
Select one of the following as needed:	3	
State Minimum Core Social Sciences (Satisfies General Education Outcome 3.3) (if needed) ⁵		
PHIL 21003 Introduction to Ethics (ACTS Equivalency = PHIL 1003) (Satisfies General Education Outcomes 3.2 and 5.1)		
PHIL 22003 Logic (ACTS Equivalency = PHIL 1003) ³		
PHIL 31103 Environmental Ethics ^{3,4}		
PHIL 42103 Philosophy of Science ^{3,4}		
Select one of the following:	4	3-4
BIOL 38773 General Ecology & BIOL 38771 General Ecology Laboratory ^{3,4}		
BIOL 30473 Evolutionary Biology ((if still needed) or) ^{3,4}		
BIOL 3000-4000 Level Elective ^{3,4}		3-4
BIOL 3000-4000 Level Elective ^{3,4}		3-4
PHYS 20203 College Physics II (ACTS Equivalency = PHYS 2024 Lecture) & PHYS 20201 College Physics II Laboratory (ACTS Equivalency = PHYS 2024 Lab) ³	3	4
General Elective		3
General Elective (select a course that satisfies General Education Outcome 1.2) ^B		3
Year Total:	18	18

Fourth Year	Units	
	Fall	Spring
BIOL 3000-4000 Level Biology Elective ^{3,4}	3-4	
BIOL 3000-4000 Level Biology Elective ^{3,4}	3-4	
General Electives	6	
BIOL 3000-4000 Level Elective ^{3,4}		3-4
BIOL 3000-4000 Level Elective ^{3,4}		3-4
Upper Level Elective in Fulbright College (if needed for 24-hour rule) or General Elective		3
General Electives (as needed to total 120 degree hours)		3-4
Year Total:	12	9

Total Units in Sequence: 120

General Education Outcome 6.1: Biology Capstone Experience
 Biology Capstone Experience and the Fulbright College writing requirement may be met by one of the following:

1. Completion of an Honors research project and preparation of a thesis (BIOL 499HV): Students will prepare an Honors thesis on original research and an oral presentation of the research to an Honors defense committee followed by defense. Students using this approach will satisfy General Education outcome 1.2 and partially satisfy General Education outcome 6.1 (additional requirement below).
 or

2. Completion of a senior thesis (BIOL 4987V) supervised by a faculty member in Biological Sciences following the guidelines defined by the Department of Biological Sciences. Students must enroll in BIOL 4987V with the supervising faculty member in the semester they are preparing the thesis. Students using this approach will partially satisfy General Education outcome 6.1 (additional requirement below).

and

3. In addition to one of the above: All Biology majors, Honors and non-Honors, must complete and submit a 1,250-word document demonstrating at least three of the five skills and abilities listed below that were used in their Capstone Experience. In completing the document, students should reflect on the skills and abilities gained through Learning outcomes 1 through 5 and how these were utilized in completing the integrative project (To complete General Education outcome 6.1).
- Written, oral, and/or multimodal communication abilities
 - Quantitative literacy
 - Characteristics of inquiry and action in the major and in one of the Learning Outcomes under Goal 3 besides the disciplinary area of the major
 - Diversity awareness and/or intercultural competency
 - Critical thinking and/or ethical reasoning

¹ Students have demonstrated successful completion of the learning indicators identified for learning outcome 2.1, by meeting the prerequisites for MATH 12003, MATH 13004, or MATH 24004.

² The Fine Arts Elective courses which satisfy General Education Outcome 3.1 include: ARCH 10003, ARHS 10003, COMM 10003, DANC 10003, LARC 10003, MUSC 10003, MUSC 100H3, MUSC 10103, MUSC 101H3, MUSC 13303, THTR 10003, THTR 10103, or THTR 101H3.

³ Meets 40-hour advanced credit hour requirement. See College Academic Regulations (<http://catalog.uark.edu/undergraduatecatalog/collegesandschools/jwilliamfulbrightcollegeofartsandsciences/>).

⁴ Meets 24-hour rule (24 hours of 3000-4000 level courses in Fulbright College), in addition to meeting the 40-hour rule. See College Academic Regulations (<http://catalog.uark.edu/undergraduatecatalog/collegesandschools/jwilliamfulbrightcollegeofartsandsciences/>).

⁵ The Social Sciences Elective courses which satisfy General Education Outcome 3.3 include: AGEC 11003, AGEC 21003, ANTH 10203, COMM 10203, ECON 21003, ECON 22003, ECON 21403, EDST 20003, HDFS 14003, HDFS 24103, HDFS 26003, HIST 11193, HIST 111H3, HIST 11293, HIST 112H3, HIST 20003, HIST 20103, HIST 20903, HUMN 111H4, HUMN 211H4, INST 28103, INST 281H3, PLSC 20003, PLSC 20103, PLSC 21003, PLSC 28103, PLSC 281H3, PSYC 20003, RESM 28503, SOCI 10103, SOCI 101H3, or SOCI 20103.

⁶ Courses which satisfy the General Education Outcome 4.1 include: AGEC 23003, AMPD 10103, ANTH 10203, ANTH 10303, ANTH 40103, ARCH 10003, CATE 31003, CLST 10003, CLST 100H3, CLST 10103, COMM 10203, GEOG 21003, GEOG 210H3, GERM 20103, HDFS 14003, HDFS 24103, HDFS 24903, HIST 11193, HIST 111H3, HIST 11293, HIST 112H3, HIST 20903, HORT 11003, HRDE 41303, HUMN 111H4, HUMN 112H4, HUMN 211H4, HUMN 22103, INST 28103, INST 281H3, LALS 20103, LARC 10003, MUSY 20003, MUSY 200H3, NURS 40233, PHIL 31103, PHIL 40903, PHIL 41103, PLSC 20103, PLSC 28103, PLSC 281H3, RESM 28503,

SCWK 31903, SOCI 10103, SOCI 101H3, SOCI 20103, ENGL 11103, ENGL 11203, or intermediate-level world language.

⁷ The Humanities Elective courses which satisfy both General Education Outcomes 3.2 and 5.1 include:

CLST 10003, CLST 100H3, CLST 10103, HUMN 112H4, PHIL 20003, PHIL 200H3, PHIL 21003.

⁸ Courses which satisfy the General Education Outcome 1.2 include: ACOM 31403, ACOM 314H3, AGED 31303, AGED 41203, CATE 40103, CATE 40612, SPCH 10003, ENGL 10303, ENGL 103H3, INST 33003, INST 35003, INST 36003, INST 46003, NURS 40932, NURS 41152, or NURS 47031.

Requirements for a Minor in Biology:

Students must complete at least 19 credit hours of BIOL courses that include:

- BIOL 10104 Biology for Majors (ACTS Equivalency = BIOL 1014 Lecture) or BIOL 10103 Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture)/BIOL 10101 Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)
- Three of the four biology core courses: BIOL 25473 Cell Biology, BIOL 23373 General Genetics, BIOL 30473 Evolutionary Biology, BIOL 38773 General Ecology.
- Two additional BIOL courses, one of which must be a BIOL course numbered 3000 or above. This may include an additional BIOL core course.

Students must notify their academic dean's office of their intent to minor in biology.

Requirements for Departmental Honors in Biology: The biological sciences honors program is designed to provide students an opportunity to investigate questions in biology through an expanded reading program and research experience. Biological science majors may apply to enter the program between the second semester of the sophomore year and the end of the junior year. Application is made through both Honors Studies (Old Main 517) and the Department of Biological Sciences (Science and Engineering 601). Applicants must have a 3.5 grade-point average. Students should consult with their adviser to identify and contact a potential faculty research mentor. The student's research activities will then be directed by the departmental faculty member who agrees to sponsor the student.

Students may enroll for up to four hours of credit in BIOL 499HV during the junior year and up to eight hours of credit in BIOL 499HV during the senior year. A maximum of six of these credits may be applied toward a major. Participants must complete and defend an honors thesis and take 12 hours in Honors Studies, which may include six hours of thesis. The honors thesis is based on an original research project and presented orally before a committee composed of two faculty from the biological sciences, a person from outside the biological sciences, and a representative from the Honors Council. This committee makes a recommendation concerning the award of the honors distinction to the Honors Council. Students who successfully complete the departmental honors program usually graduate as "Departmental Scholar *Cum Laude*." Higher degree distinctions are recommended only in exceptional cases and are based upon the candidate's entire involvement in the honors program. Completion of an honors thesis fulfills the writing requirement in biological sciences, which precludes credit for BIOL 4987V (Senior Thesis) for the same body of work.

Biology/Life Science Teacher Licensure Requirements:

Students interested in pursuing a minor in STEM Education (<http://catalog.uark.edu/undergraduatecatalog/collegesandschools/collegeofeducationandhealthprofessions/stemeducation/#minorinstemeducationtext>) or a minor in STEM Education with Secondary Teacher Licensure in mathematics, biology, chemistry, physics, or computer science at the undergraduate level should consult with their assigned academic adviser or find more information at stem.uark.edu (<http://stem.uark.edu/>). Another option to obtain secondary teacher licensure is to complete the one-year Master of Arts in Teaching (<http://catalog.uark.edu/graduatecatalog/programsofstudy/teachereducation/>).

Faculty

Airubaye, Adnan A., Ph.D., M.Ed. (University of Arkansas), M.Sc. (University of Baghdad), Assistant Professor, 2016, 2021.

Alverson, Andrew James, Ph.D. (University of Texas at Austin), M.S. (Iowa State University), B.S. (Grand Valley State University), Associate Professor, 2012, 2018.

Bailey, Tameka A., Ph.D. (University of Arkansas), B.S. (University of Arkansas-Pine Bluff), Research Assistant Professor, 2017.

Beaulieu, Jeremy M., Ph.D. (Yale University), M.S., B.S. (California Polytechnic State University), Associate Professor, 2016, 2021.

Beaupre, Steven J., Ph.D. (University of Pennsylvania), M.S., B.S. (University of Wisconsin), Professor, 1995, 2006.

Catanzaro, Donald G., Ph.D. (University of Arkansas), A.B. (University of California, Los Angeles), Research Assistant Professor, 2014.

Ceballos, Ruben M., Ph.D. (University of Montana), M.A. (University of Alabama-Birmingham), B.S. (University of Alabama-Huntsville), Assistant Professor, 2016.

DeGregorio, Brett A., Ph.D. (University of Illinois at Urbana-Champaign), M.S. (Purdue University), B.S. (University of Massachusetts at Amherst), Research Associate Professor, 2019.

Douglas, Marlis R., Ph.D., M.S., B.S. (University of Zurich), Professor, Bruker Life Sciences Chair, 2012.

Douglas, Michael Edward, Ph.D. (University of Georgia), M.S., B.S. (University of Louisville), Professor, 21st Century Chair in Global Change Biology, 2011.

Du, Yuchun, Ph.D. (Kagoshima University, Japan), B.S. (Shaanxi University of Technology, China), Associate Professor, 2007, 2013.

DuRant, Sarah Elizabeth, Ph.D. (Virginia Polytechnic Institute and State University), B.S. (University of South Carolina), Associate Professor, 2017, 2021.

Durdik, Jeannine M., Ph.D. (Johns Hopkins University), B.S. (Purdue University), Professor, 1994, 2004.

Etges, William J., Ph.D. (University of Rochester), M.S. (University of Georgia), B.S. (North Carolina State University), Professor, 1987, 2004.

Evans, Timothy A., Ph.D. (Indiana University), B.S. (Slippery Rock University), Associate Professor, 2013, 2019.

Evans-White, Michelle Allayne, Ph.D. (University of Notre Dame), M.S., B.S. (Kansas State University), Professor, 2008, 2018.

Forbes, Kristian M., Ph.D. (University of Jyväskylä), M.P.H. (Latrobe University), B.Sc. (Latrobe University), Assistant Professor, 2018.

Henry, Ralph Leroy, Ph.D., M.S. (Kansas State University), B.S.E. (University of Kansas), Distinguished Professor, W.M. Keck Endowed Professorship, 1996, 2012.

Ivey, Mack, Ph.D., B.S. (University of Georgia), Associate Professor, 1992, 1998.

Iyer, Shilpa, Ph.D. (University of Georgia), M.Sc., B.Sc. (University of Pune, India), Assistant Professor, 2016.

Kral, Timothy Alan, Ph.D. (University of Florida), B.S. (John Carroll University), Professor, 1981, 2008.

Lehmann, Michael Herbert, Ph.D., Diploma in Biology (Philipps University of Marburg, Germany), Professor, 2002, 2018.

Lessner, Daniel J., Ph.D. (University of Iowa), B.S. (University of Wisconsin-Stevens Point), Professor, 2008, 2020.

Lessner, Faith H., Ph.D. (University of Iowa), B.S. (Cornell University), Teaching Assistant Professor, 2016, 2018.

Lewis, Jeffrey A., Ph.D. (University of Wisconsin-Madison), B.S. (University of California-Santa Barbara), Associate Professor, 2013, 2020.

Lorince, Tammy, M.A., B.S. (University of Arkansas), Instructor, 2000.

Magoulick, Daniel D., Ph.D. (University of Pittsburgh), M.S. (Eastern Michigan University), B.S. (Michigan State University), Research Professor, 2000, 2010.

McNabb, David S., Ph.D. (Louisiana State University Health Sciences Center), B.S. (University of Texas at Arlington), Associate Professor, 2000, 2006.

Mortensen, Jennifer, Ph.D. (Tufts University), M.S. (Villanova University), Teaching Assistant Professor, 2019.

Naithani, Kusum, Ph.D. (University of Wyoming), M.Sc. (G.B. Pant University of Agriculture and Technology-India), B.Sc. (University of Lucknow-India), Associate Professor, 2014, 2021.

Nakanishi, Nagayasu, Ph.D. (University of California, Los Angeles), B.S. (University of California, San Diego), Assistant Professor, 2017.

Ortega, Jason, M.S. (University of Texas-Pan American), B.S. (Cornell University), Instructor, 2019.

Paré, Adam C., Ph.D. (University of California, San Diego), B.S. (Cornell University), Assistant Professor, 2019.

Pinto, Ines, Ph.D. (Louisiana State University Health Sciences Center), M.S., B.S. (University of Chile), Associate Professor, 2000, 2006.

Rhoads, Douglas Duane, Ph.D. (Kansas State University), M.A., B.A. (Wichita State University), University Professor, 1990, 2006.

Shadwick, John D.L., M.S. (University of Arkansas), B.S. (University of Central Arkansas), Instructor, 2011.

Siepielski, Adam M., Ph.D. (University of Wyoming-Laramie), M.S. (New Mexico State University), B.S. (Pennsylvania State University-University Park), Associate Professor, 2015, 2019.

Stephenson, Steven Lee, Ph.D., M.S. (Virginia Polytechnic Institute and State University), B.S. (Lynchburg College), Research Professor, 2003.

Tipsmark, Christian K., Ph.D., M.S. (University of Southern Denmark), Associate Professor, 2010, 2016.

Walker, James M., Ph.D. (University of Colorado-Boulder), M.S., B.S. (Louisiana Polytechnic Institute), Professor, 1965.

Walker, Kate Ireton, M.S. (University of Arkansas), B.S. (Kansas State University), Instructor, 2014.

Westerman, Erica L., Ph.D. (Yale University), M.Sc. (University of New Hampshire), B.S. (Yale University), Assistant Professor, 2016.

Willson, John David, Ph.D. (University of Georgia), B.S. (Davidson College), Associate Professor, 2012, 2018.

Zhuang, Xuan, Ph.D. (University of Illinois Urbana-Champaign), Assistant Professor, 2021.

Courses

BIOL 10004. Biological Principles (ACTS Equivalency = BIOL 1004 Lecture). 4 Hours.

Integrated lecture and laboratory focusing on the overriding principles of Biology. Designed to convey biological reasoning to non-science majors. May not count as prerequisite for advanced courses in BIOL. Corequisite: Lab component. (Typically offered: Fall, Spring and Summer)

BIOL 10101. Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab). 1 Hour.

Experimental and observational techniques used in biology with emphasis on the acquisition and interpretation of results that illustrate major biological principles.

Corequisite: BIOL 10103. (Typically offered: Fall, Spring and Summer)

BIOL 10103. Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture). 3 Hours.

Principles that unify biology with emphasis on scientific study that demonstrates how all organisms are the product of evolution and are parts of interacting systems from the molecular to the ecosystem level. Corequisite: BIOL 10101. (Typically offered: Fall, Spring and Summer)

BIOL 10104. Biology for Majors (ACTS Equivalency = BIOL 1014 Lecture). 4 Hours.

Integrated lecture and laboratory course designed to prepare Biology Majors to enter the rest of the Biology Core of Cell Biology, General Genetics, Evolutionary Biology, and General Ecology. Pre- or Corequisite: CHEM 14103 or CHEM 12073. (Typically offered: Fall and Spring)

BIOL 101H1. Honors Principles of Biology Laboratory. 1 Hour.

This course is designed for the well prepared student in the Honors program. It focuses on teaching students experimental and observational techniques used in the science of biology. It emphasizes the acquisition and interpretation of results that illustrate the major principles of biology. Corequisite: BIOL 101H3 or BIOL 10103. (Typically offered: Fall and Spring)

BIOL 101H3. Honors Principles of Biology. 3 Hours.

This course is designed for the well prepared student in Honors program. It focuses on the principles that unify the science of biology. Students will be exposed to how scientific principles have been used to demonstrate that all organisms are the products of evolution and are parts of interacting systems from the molecular to the ecosystem level. Corequisite: BIOL 101H1 or BIOL 10101. (Typically offered: Fall and Spring)

BIOL 10301. Plant Biology Laboratory (ACTS Equivalency = BIOL 1034 Lab). 1 Hour.

Plant biology lab. Pre- or Corequisite: BIOL 10303. (Typically offered: Spring and Summer)

BIOL 10303. Plant Biology (ACTS Equivalency = BIOL 1034 Lecture). 3 Hours.

Consideration of basic flowering plant structure, growth, development, physiology, genetics, ecology, and a brief survey of other plant groups. Lecture 3 hours per week. BIOL 10301 is recommended as a corequisite and both are required for partial fulfillment of the Fulbright College natural sciences requirement. Prerequisite: BIOL 10104 or BIOL 10103 and BIOL 10101. (Typically offered: Spring and Summer)

BIOL 10501. Principles of Zoology Laboratory (ACTS Equivalency = BIOL 1054 Lab). 1 Hour.

Laboratory exercises illustrating animal structure, physiology, genetics, and ecology. Corequisite: BIOL 10503. (Typically offered: Fall and Summer)

BIOL 10503. Principles of Zoology (ACTS Equivalency = BIOL 1054 Lecture). 3 Hours.

Introduction to zoological principles relating to cells, organ systems, development, genetics, ecology, and animal phyla. Corequisite: BIOL 10501. Prerequisite: BIOL 10104 or BIOL 10103 and BIOL 10101. (Typically offered: Fall and Summer)

BIOL 16973. Biology Bridges. 3 Hours.

Prepares students for advanced biology courses including genetics, cell biology, ecology, and evolutionary biology, among others. Synthesizes sub-disciplines within biology using the underlying concepts of evolutionary theory found in scientific literature. Prerequisite: BIOL 10103 or BIOL 10104. (Typically offered: Spring)

BIOL 20001. General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab). 1 Hour.

Techniques for handling microorganisms. Does not count toward BS in Biology.

Corequisite: BIOL 20003. (Typically offered: Fall, Spring and Summer)

BIOL 20003. General Microbiology (ACTS Equivalency = BIOL 2004 Lecture). 3 Hours.

Basic concepts of microbiology including diversity, genetics, metabolism, growth, control of growth, pathogenesis, and immunology. Does not count towards BS in Biology. Corequisite: BIOL 20001. Prerequisite: (BIOL 10103 and BIOL 10101) or BIOL 10104) and (CHEM 12103 and CHEM 12101 or CHEM 14103 or CHEM 14203 and CHEM 14201 or CHEM 12073 and CHEM 12071). (Typically offered: Fall, Spring and Summer)

BIOL 200H1. Honors General Microbiology Laboratory. 1 Hour.

Techniques for handling microorganisms. Does not count towards BS in Biology.

Corequisite: BIOL 20003. (Typically offered: Fall, Spring and Summer)

BIOL 23371. General Genetics Laboratory. 1 Hour.

Analysis of genetic problems and experiments with emphasis on "hands-on" experience with a variety of organisms. May require time outside laboratory period. Laboratory 3 hours per week. Pre- or Corequisite: BIOL 23373. (Typically offered: Fall and Spring)

BIOL 23373. General Genetics. 3 Hours.

Surveys of Mendelian, molecular, and population mechanisms of inheritance and gene expression in prokaryotes and eukaryotes. Lecture 3 hours per week. Prerequisite: (BIOL 10104 or BIOL 10103 and BIOL 10101) and (CHEM 14103 or CHEM 12073) and (MATH 11003 or higher or STAT 28233 or MATH 21003 or equivalent). (Typically offered: Fall and Spring)

BIOL 24001. Human Anatomy Laboratory (ACTS Equivalency = BIOL 2404 Lab). 1 Hour.

Laboratory 3 hours exercises in mammalian anatomy. Cannot be taken without prior credit in BIOL 24003 or concurrent enrollment in BIOL 24003. Does not count toward BS in Biology. Corequisite: BIOL 24003. (Typically offered: Fall, Spring and Summer)

BIOL 24003. Human Anatomy (ACTS Equivalency = BIOL 2404 Lecture). 3 Hours.

Description of human body as a series of organ systems and their interrelationships. Does not count towards BS in Biology. Corequisite: BIOL 24001. Prerequisite: Four hours of biological sciences. (Typically offered: Fall, Spring and Summer)

BIOL 24101. Human Physiology Laboratory (ACTS Equivalency = BIOL 2414 Lab). 1 Hour.

Exercises include experiments on osmosis, reflexes, senses, muscle, cardiovascular system, ventilation, metabolism, renal function, etc. Data collection, analysis, and report writing. Does not satisfy the Fulbright College writing requirement. Does not count toward BS in Biology. Corequisite: BIOL 24103. (Typically offered: Fall and Spring)

BIOL 24103. Human Physiology (ACTS Equivalency = BIOL 2414 Lecture). 3 Hours.

Fundamental concepts of physiology with emphasis in the human. Does not count toward BS in Biology. Corequisite: BIOL 24101. Prerequisite: (CHEM 12103 and CHEM 12101) or (CHEM 14103) or (CHEM 14203 and CHEM 14201) and MATH 11003. (Typically offered: Fall and Spring)

BIOL 25471. Cell Biology Laboratory. 1 Hour.

Introduction to methods and techniques used in Cell Biology research. Laboratory experiences to highlight topics covered in BIOL 25473. Pre- or Corequisite: BIOL 25473. (Typically offered: Fall and Spring)

BIOL 25473. Cell Biology. 3 Hours.

Introduction to cell structure, cell processes, biological polymers, energetics, and diversity. An introduction to biochemistry and cell chemistry. Recommended: (CHEM 14203 and CHEM 14201) or (CHEM 12283 and CHEM 12281) or equivalent. Prerequisite: BIOL 10104, or BIOL 10103 and BIOL 10101. (Typically offered: Fall and Spring)

BIOL 30171. Principles of Plant Pathology Lab. 1 Hour.

Lab course in examination of the causes and symptoms of plant disease and the genetics of plant disease. Physiology, and ecology of host-pathogen interactions. Spread of disease and principles of disease control. Pre- or Corequisite: PLPA 30003 or BIOL 30173. (Typically offered: Fall)

BIOL 30173. Principles of Plant Pathology. 3 Hours.

Examination of the causes and symptoms of plant disease and the genetics of plant disease. Physiology, and ecology of host-pathogen interactions. Spread of disease and principles of disease control. (Typically offered: Fall)

BIOL 30271. Introduction to Insect Identification Lab. 1 Hour.

Introductory lab course on insect identification, collection, and curation techniques, primarily designed as an intensive add-on to BIOL 30373 for students wanting a more in-depth examination of insect diversity. Insect collection required. Course includes field trips. Students are encouraged to contact instructor before enrolling. Pre- or corequisite: BIOL 30373. (Typically offered: Fall)

BIOL 30373. Introduction to Entomology. 3 Hours.

Fundamentals of insect biology including structure and function, development, ecology, behavior, plant feeding and disease transmission. Lecture 3 hours/week. Students interested in a more intensive examination of insects, including collection, curation, and identification techniques, should sign up for the separate one credit lab BIOL 30271. Students are strongly encouraged to take BIOL 10103 before registering for this course. (Typically offered: Fall)

BIOL 30473. Evolutionary Biology. 3 Hours.

An introduction to the mechanisms and patterns of evolutionary change. Seeks to develop logical, scientific skills and to apply them in understanding how life has changed during the history of the earth. Corequisite: Drill component. Prerequisite: (BIOL 10104 or BIOL 10103, BIOL 10101) and BIOL 23373. (Typically offered: Fall and Spring)

BIOL 30573. Bones, Bodies, and Brains in Evolutionary Perspective. 3 Hours.

Reviews the anatomy of the human body, comparing this anatomy with primates, mammals, and vertebrates, and it will consider how the major features of the human body emerged throughout evolution. (Typically offered: Spring)

BIOL 32773. Inquiry and Modeling in Science Education. 3 Hours.

Study of science practices with emphasis on modeling and inquiry for learning/teaching. Includes practical, philosophical, cognitive, and disciplinary specific dimensions of doing science in academic and nonacademic settings. Includes planning and implementing multiple scientific inquiries, engaging in reflective practices, writing and presenting scientific information. Safety and ethical issues are included. Prerequisite: 8 hours of BIOL courses. Corequisite: Drill component. (Typically offered: Fall and Spring)
This course is cross-listed with PHYS 3273, CHEM 3273, BIOL 3273.

BIOL 34074. Comparative Vertebrate Morphology. 4 Hours.

Anatomy of selected vertebrate animals with emphasis upon homologous structures in various animal groups. The recommended anatomy course for Biology BS majors. Lecture 2 or 3 hours, laboratory 4 or 6 hours per week. Corequisite: Lab component. Prerequisite: BIOL 10104 or BIOL 10103 and BIOL 10101. (Typically offered: Fall and Spring)

BIOL 38771. General Ecology Laboratory. 1 Hour.

General ecology lab. Pre- or Corequisite: BIOL 38773. (Typically offered: Fall)

BIOL 38773. General Ecology. 3 Hours.

Ecological principles and concepts; environmental factors and interactions that determine distribution and abundance of organisms. Prerequisite: 7 hours of biological science. (Typically offered: Fall and Spring)

BIOL 392H3. Honors Colloquium. 3 Hours.

Covers a special topic or issue, offered as part of the honors program. Prerequisite: honors candidacy (not restricted to candidacy in biological sciences). (Typically offered: Irregular) May be repeated for degree credit.

BIOL 40063. Laboratory in Prokaryote Biology. 3 Hours.

Laboratory techniques in prokaryote culture, identification, physiology, metabolism, and genetics. Laboratory 6 hours per week. Prerequisite: BIOL 40403. (Typically offered: Fall and Spring)

BIOL 40173. Insect Behavior and Chemical Ecology. 3 Hours.

Basic concepts in insect senses and patterns of behavioral responses to various environmental stimuli. Previous knowledge of basic entomology is helpful, but not required. Lecture 2 hours, laboratory/discussion 2 hours per week. Corequisite: Lab component. (Typically offered: Spring Even Years)
This course is cross-listed with BIOL 4017, ENTO 4010.

BIOL 40274. Insect Diversity and Taxonomy. 4 Hours.

Principles and practices of insect classification and identification with emphasis on adult insects. Corequisite: Lab component. Prerequisite: ENTO 30103. (Typically offered: Fall Even Years)
This course is cross-listed with BIOL 4027, ENTO 4020.

BIOL 40403. Prokaryote Biology. 3 Hours.

An in-depth coverage of prokaryote diversity, genetics, metabolism, growth, structures and functions. Prerequisite: BIOL 25473. (Typically offered: Spring)

BIOL 40573. Insect Ecology. 3 Hours.

To develop understanding of important ecological concepts through study of dynamic relationships among insects and their environment. To become familiar with the literature of insect ecology, and interpretation and critique of ecological research. Previous knowledge of basic entomology and/or ecology will be assumed. Corequisite: Lab component. (Typically offered: Fall Even Years)
This course is cross-listed with BIOL 4057, ENTO 4050.

BIOL 40703. Mitochondrial Biology and Medicine. 3 Hours.

Overview of mitochondrial biology with a focus on the clinical spectrum of human diseases affected by dysfunctional mitochondria. Introduces basic mitochondrial biology, structure and function, genetics and bioenergetics. Highlights common and rare diseases influenced by mitochondrial malfunction. Prerequisite: BIOL 25473. (Typically offered: Fall)

BIOL 41074. Taxonomy of Flowering Plants. 4 Hours.

Identifying, naming, and classifying of wildflowers, weeds, trees, and other flowering plants. Emphasis is on the practical aspects of plant identification. Lecture 3 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: BIOL 10303 and BIOL 10301 and BIOL 23373 and BIOL 30473. (Typically offered: Spring)

BIOL 41174. Dendrology. 4 Hours.

Morphology, classification, geographic distribution, and ecology of woody plants. Lecture 3 hours, laboratory 3 hours per week, and fieldtrips. Corequisite: Lab component. Prerequisite: BIOL 38773. (Typically offered: Fall)

BIOL 41272. Food Microbiology. 2 Hours.

The study of food microbiology including classification/taxonomy, contamination, preservation and spoilage of different kinds of foods, pathogenic microorganisms, food poisoning, sanitation, control and inspection and beneficial uses of microorganisms. Prerequisite: BIOL 20003 and BIOL 20001 or BIOL 25473. (Typically offered: Fall)

BIOL 41373. Plant Disease Control. 3 Hours.

Principles, methods and mechanics of plant disease control. Emphasis is given to the integration of control measures and epidemiology of plant diseases. Lecture 3 hours per week. Prerequisite: PLPA 30003. (Typically offered: Fall)

BIOL 41573. Biology of Global Change. 3 Hours.

Covers impact of global change on sustainability and adaptability of biological systems. Corequisite: BIOL 42572. Prerequisite: (BIOL 10103 and BIOL 10101) or BIOL 10104. (Typically offered: Spring)

BIOL 41673. Dynamic Models in Biology. 3 Hours.

Mathematical and computational techniques for developing, executing, and analyzing dynamic models arising in the biological sciences. Both discrete and continuous time models are studied. Applications include population dynamics, cellular dynamics, and the spread of infectious diseases. Prerequisite: MATH 24004. (Typically offered: Irregular)

BIOL 41774. Conservation Genetics. 4 Hours.

Covers concepts of biodiversity identification and illustrates how genetic data are generated and analyzed to conserve and restore biological diversity. Corequisite: Lab component and drill. Prerequisite: BIOL 30473, BIOL 38773 and STAT 28233 (or equivalent), and Junior standing. (Typically offered: Spring)

BIOL 42173. Biological Regulation and Subcellular Communication. 3 Hours.

Combines lectures, review of primary literature, student presentations, and small group discussions to explore a diversity of topics related to mechanisms of biological regulation and subcellular communication. Prerequisite: BIOL 23373 and BIOL 25473. (Typically offered: Irregular)

BIOL 42273. Bacterial Lifestyles. 3 Hours.

Introduces students to bacteria as prokaryotic organisms, different from eukaryotes such as plants and animals. Model microbial systems will be studied to identify unique strategies that bacteria employ to thrive in their respective environments or develop special adaptations to harsh environments. Prerequisite: BIOL 20003 and BIOL 20001 or BIOL 40403. (Typically offered: Spring Odd Years)

BIOL 42373. Genomics and Bioinformatics. 3 Hours.

Principles of molecular and computational analyses of genomes. Prerequisite: BIOL 25473 and BIOL 23373. (Typically offered: Spring)

BIOL 42384. Comparative Physiology. 4 Hours.

Comparison of fundamental physiological mechanisms in various animal groups. Adaptations to environmental factors at both the organismal and cellular levels are emphasized. Lecture 3 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: BIOL 25473 and CHEM 36203 and (CHEM 36201 or CHEM 362H2). (Typically offered: Fall)

BIOL 42491. Ichthyology Laboratory. 1 Hour.

Practical application of fish identification based on anatomy, fish sampling methods, and curation of fish specimen. Laboratory component of BIOL 42493. Corequisite: BIOL 42493. (Typically offered: Spring Odd Years)

BIOL 42493. Ichthyology. 3 Hours.

Comprehensive overview of the diversity of fishes. Covers anatomy, physiology, evolution, taxonomy, ecology, behavior, zoogeography and conservation of marine and freshwater fishes. Lecture 3 hours per week. Prerequisite: Eight credits in Biology. Corequisite: BIOL 42491. (Typically offered: Spring Odd Years)

BIOL 424H1. Honors Ichthyology Laboratory. 1 Hour.

Practical application of fish identification based on anatomy, fish sampling methods, and curation of fish specimen. Laboratory component of BIOL 424H3. Prerequisite: Honors standing. Corequisite: BIOL 424H3. (Typically offered: Spring Odd Years)

BIOL 424H3. Honors Ichthyology. 3 Hours.

Comprehensive overview of the diversity of fishes. Covers anatomy, physiology, evolution, taxonomy, ecology, behavior, zoogeography and conservation of marine and freshwater fishes. Lecture 3 hours per week. Prerequisite: Eight credits in Biology and honors standing. Corequisite: BIOL 42491. (Typically offered: Spring Odd Years)

BIOL 42572. Biology of Global Change Seminar. 2 Hours.

Readings, essays, and group discussions that parallel the 27 lectures in BIOL 41573 and which dissect the resulting impacts of global change on sustainability and adaptability of biological systems. Corequisite: BIOL 41573. Prerequisite: BIOL 10104 or BIOL 10103 and BIOL 10101. (Typically offered: Spring)

BIOL 425H2. Honors Biology of Global Change Seminar. 2 Hours.

Readings, essays, and group discussions that parallel the 27 lectures in BIOL 41573 and which dissect the resulting impacts of global change on sustainability and adaptability of biological systems. Corequisite: BIOL 41573. Prerequisite: BIOL 10104 or BIOL 10103 and BIOL 10101. (Typically offered: Spring)

BIOL 42673. Cell Physiology. 3 Hours.

In-depth molecular coverage of cellular processes involved in growth, metabolism, transport, excitation, signalling and motility, with emphasis on function and regulation in eukaryotes, primarily animals. Prerequisite: BIOL 25473 and BIOL 23373 and CHEM 38103 and PHYS 20203. (Typically offered: Fall)

BIOL 42773. Endocrinology. 3 Hours.

In endocrinology we study hormonal integration of living processes as all levels from molecule to organism. We will work with the mechanisms of hormone action, the endocrine control axes and hormones physiological role. The course will include paper discussions and student presentations on topics of special interest. Prerequisite: BIOL 25473 or equivalent. (Typically offered: Spring)

BIOL 43173. Molecular Cell Biology. 3 Hours.

In-depth molecular coverage of transcription, cell cycle, translation, and protein processing in eukaryotes and prokaryotes. Prerequisite: BIOL 25473 and BIOL 23373 and CHEM 36053 and CHEM 36051 and CHEM 36203 and CHEM 36201. (Typically offered: Spring)

BIOL 431H3. Honors Molecular Cell Biology. 3 Hours.

In-depth molecular coverage of transcription, cell cycle, translation, and protein processing in eukaryotes and prokaryotes. Prerequisite: BIOL 25473 and BIOL 23373 and CHEM 36053 and CHEM 36051 and CHEM 36203 and CHEM 36201. (Typically offered: Spring)

BIOL 43273. Comparative Neurobiology. 3 Hours.

Exploration of modern research approaches to understanding the development and function of animal nervous systems, with emphasis on molecular and cellular approaches in non-human animal models commonly used in biomedical research. Format combines lectures, group discussions, and student presentations using examples from the primary neurobiology literature. Prerequisite: BIOL 23373 and BIOL 25473 or equivalents. (Typically offered: Irregular)

BIOL 43373. Biotechnology in Agriculture. 3 Hours.

Discussion of the techniques, applications, and issues of biotechnology as it is being used in modern agriculture. Coverage includes the basics of molecular biology, production of transgenic plants and animals, and new applications in the agricultural, food, and medical marketplace. Lecture and discussion, 3 hours per week. (Typically offered: Fall)

This course is cross-listed with BIOL 4337, PLPA 4330.

BIOL 43573. Ecological Genetics/Genomics. 3 Hours.

Analysis of the genetics of natural and laboratory populations with emphasis on the ecological bases of evolutionary change. Prerequisite: BIOL 23373 and BIOL 23371 and MATH 24004 and STAT 28233 or equivalents. (Typically offered: Fall Odd Years)

BIOL 44373. Principles of Evolution. 3 Hours.

Advanced survey of the mechanisms of evolutionary change with special emphasis on advances since the Modern Synthesis. Historical, theoretical, and population genetics approaches are discussed. Recommended BIOL 30473 and BIOL 23371 and BIOL 38771. Prerequisite: BIOL 23373 and BIOL 38773. (Typically offered: Fall Even Years)

BIOL 44673. Physiological Ecology. 3 Hours.

Interactions between environment, physiology, and properties of individuals and populations on both evolutionary and ecological scales. Prerequisite: BIOL 38773 and BIOL 42384 and its lab component. (Typically offered: Spring Odd Years)

BIOL 45151. Population Ecology Laboratory. 1 Hour.

Population Ecology Lab. Pre- or Corequisite: BIOL 45153. (Typically offered: Fall Even Years)

BIOL 45153. Population Ecology. 3 Hours.

Survey of theoretical and applied aspects of population processes stressing models of growth, interspecific interactions, and adaptation to physical and biotic environments. Prerequisite: BIOL 38773. (Typically offered: Fall Even Years)

BIOL 45263. Plant Ecology. 3 Hours.

To develop understanding of important ecological concepts through study of dynamics relationships among plants and their environment. To become familiar with the literature of plant ecology, and interpretation and critique of ecological research. Prerequisite: BIOL 38773. (Typically offered: Spring Even Years)

BIOL 45473. Developmental Biology. 3 Hours.

An analysis of the principles and mechanisms of development emphasizing the embryonic and postembryonic development of animals. Prerequisite: BIOL 25473 and BIOL 23373. (Typically offered: Irregular)

BIOL 45574. Developmental Biology with Laboratory. 4 Hours.

An analysis of the concepts of mechanisms of development emphasizing the experimental approach. Lecture 3 hours, laboratory 3 hours per week. Students may not receive degree credit for both BIOL 45473 and BIOL 45574. Corequisite: Lab component. Prerequisite: BIOL 25473 and BIOL 23373 or graduate standing. (Typically offered: Fall)

BIOL 45673. Cancer Biology. 3 Hours.

An introduction to the fundamentals of cancer biology. Prerequisite: BIOL 25473. (Typically offered: Fall)

BIOL 45703. Laboratory in Marine Invertebrate Development and Evolution. 3 Hours.

Provides a hands-on introduction to investigation of problems in marine invertebrate development and evolution. Emphasizes comparative molecular genetic approaches using non-traditional model organisms. The topic of research may vary from year to year; examples include, but are not limited to, the mechanisms of life cycle transition. Prerequisite: BIOL 23373. (Typically offered: Fall)

BIOL 45803. Genetic Engineering. 3 Hours.

Provides an overview of current methods for altering gene expression, as well as ethical concerns arising from genetic engineering. Special emphasis is placed on practical considerations and techniques necessary for implementing genetic engineering strategies. Prerequisite: BIOL 23373 and BIOL 25473. (Typically offered: Fall)

BIOL 46173. Primate Adaptation and Evolution. 3 Hours.

Introduction to the biology of the order Primates. This course considers the comparative anatomy, behavioral ecology and paleontology of our nearest living relatives. Prerequisite: BIOL 30473 or ANTH 10143. (Typically offered: Spring)

BIOL 46973. Forest Ecology. 3 Hours.

Introduction to the various biological, ecological and historical aspects of forest communities, with particular emphasis on the forests of the central and southeastern United States. Prerequisite: BIOL 38773. (Typically offered: Irregular)

BIOL 47073. Mechanisms of Pathogenesis. 3 Hours.

A survey of the events causing human disease at the molecular, cellular and genetic levels. Seeks to develop an appreciation that both the tricks pathogens use and the body's own defenses contribute to pathology. Prerequisite: BIOL 25473. (Typically offered: Fall)

BIOL 47181. Basic Immunology Laboratory. 1 Hour.

Basic immunology laboratory. Corequisite: BIOL 47183. (Typically offered: Spring)

BIOL 47183. Basic Immunology. 3 Hours.

A general overview of immunity with emphasis on the underlying cellular, molecular, and genetic events, and discussions of more specialized issues in immunology, such as disease states involving the immune system, and other interesting problems in modern immunology. Lecture 2 hours, laboratory 4 hours per week. Prerequisite: BIOL 23373 and BIOL 25473. (Typically offered: Spring)

BIOL 471H3. Honors Basic Immunology. 3 Hours.

A general overview of Immunity with emphasis on the underlying cellular, molecular, and genetic events, and discussions of more specialized issues in Immunology, such as disease states involving the Immune system, and other interesting problems in modern Immunology. Prerequisite: BIOL 23373 and BIOL 25473. (Typically offered: Spring)

BIOL 47203. Laboratory in Microbial Fermentation. 3 Hours.

An inquiry-based lab focusing on the microbiology of brewing. Introduces students to laboratory techniques used in molecular ecology, microbial physiology, genetics, and brewing. Laboratory 6 hours per week. Pre- or corequisite: FDSC 27203. Prerequisite: BIOL 20003 or BIOL 23373 or BIOL 25473. (Typically offered: Fall Even Years)

BIOL 47374. Wildlife Management Techniques. 4 Hours.

To familiarize students with techniques used in the management of wildlife populations. Students will be exposed to field methods, approaches to data analysis, experimental design, and how to write a scientific paper. Management applications will be emphasized. Lecture 3 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: BIOL 38773. (Typically offered: Irregular)

BIOL 47474. Fish Biology. 4 Hours.

Morphology, classification, life history, population dynamics, and natural history of fishes and fish-like vertebrates. Lecture 3 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: 12 hours of biological science. (Typically offered: Spring Odd Years)

BIOL 47673. Ornithology. 3 Hours.

Taxonomy, morphology, physiology, behavior, and ecology of birds. Lecture, laboratory, and field work. Corequisite: Lab component. Prerequisite: BIOL 38773 (Typically offered: Spring Even Years)

BIOL 47774. Biometry. 4 Hours.

Students learn biological statistics and experimental design by actually designing experiments and analyzing data, as well as through lecture, discussion, reading, writing, and problem solving. Lecture 3 hours, laboratory 3 hours each week. Corequisite: Lab component. Prerequisite: (STAT 28233 or MATH 21003 or equivalent) and BIOL 38773. (Typically offered: Spring Even Years)

BIOL 47973. Introduction to Neurobiology. 3 Hours.

Exploration of the neurological underpinnings of perception, action, and experience including: how sense receptors convert information in the world into electricity, how information flows through the nervous systems, how neural wiring makes vision possible, how the nervous system changes with experience, and how the system develops. Prerequisite: BIOL 25473. (Typically offered: Spring)

BIOL 4807V. Special Topics in Biological Sciences. 1-6 Hour.

Consideration of new areas of biological sciences not yet treated adequately in other courses. Prerequisite: 8 hours of biological sciences. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

BIOL 480HV. Honors Special Topics in Biological Sciences. 1-6 Hour.

Consideration of new areas of biological sciences not yet treated adequately in other courses. Prerequisite: 8 hours of biological sciences. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

This course is equivalent to BIOL 4807V.

BIOL 48373. Animal Behavior. 3 Hours.

Organization, regulation, and phylogeny of animal behavior, emphasizing diversity across animal taxa. Lecture, laboratory, and field work. Corequisite: Lab component. (Typically offered: Spring)

BIOL 48474. Community and Ecosystem Ecology. 4 Hours.

Survey of theoretical and applied aspects of community processes stressing structure, tropic dynamics, community interactions, and major community types. Corequisite: Lab component. Prerequisite: BIOL 38773. (Typically offered: Fall Odd Years)

BIOL 48673. Analysis of Animal Populations. 3 Hours.

Basic principles of design and analysis for population studies of fish and wildlife species. Students will be instructed in the use of the latest software for estimating population parameters. Focus will be on both concepts and applications. Management applications of estimated parameters will be emphasized. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: BIOL 38773. (Typically offered: Spring Even Years)

BIOL 48773. Microbial Molecular Genetics and Informatics. 3 Hours.

Fundamentals of microbial genomics and bioinformatics. Course covers microbial genetics, genetic structure, genome organization, proteome organization, approaches for the analysis of DNA, RNA, and proteins, cellular metabolic pathways, genetic regulation, small RNA molecules, functional genomics, metagenomics, and bioinformatics approaches for analysis of microbial genomes. Prerequisite: BIOL 23373 or BIOL 25473. (Typically offered: Fall)

BIOL 48873. Mammalian Evolution and Osteology. 3 Hours.

Focuses on describing the evolutionary history of mammals, a group of vertebrates that include over 5,000 species in 29 orders, and will provide an overview of living species and their identifying features. Prerequisite: ANTH 10143 and ANTH 10141, or BIOL 10103 and BIOL 10101, or instructor consent. (Typically offered: Fall Even Years)

BIOL 4967V. Culture and Environment: Field Studies. 1-6 Hour.

May be taken by students participating in overseas study programs or other domestic field study programs approved by the department. (Typically offered: Irregular) May be repeated for up to 12 hours of degree credit.

BIOL 496HV. Honors Culture and Environment: Field Studies. 1-6 Hour.

May be taken by students participating in overseas study programs or other domestic field study programs approved by the department. (Typically offered: Irregular) May be repeated for up to 12 hours of degree credit.

This course is equivalent to BIOL 4967V.

BIOL 4987V. Senior Thesis. 1-6 Hour.

Senior thesis. (Typically offered: Fall, Spring and Summer)

BIOL 4997V. Research In Biological Sciences. 1-4 Hour.

Research. Prerequisite: Senior standing. (Typically offered: Fall, Spring and Summer) May be repeated for up to 8 hours of degree credit.

BIOL 499HV. Honors Research in Biological Sciences. 1-4 Hour.

Honors research. Prerequisite: Senior standing. (Typically offered: Fall, Spring and Summer) May be repeated for up to 8 hours of degree credit.

This course is equivalent to BIOL 4997V.