

# BIOLOGICAL SCIENCES

College of Natural Science and Mathematics  
Department of Biology and Wildlife  
907-474-7671  
[www.bw.uaf.edu](http://www.bw.uaf.edu)

## BA, BS Degrees

Minimum Requirements for Degrees: 120 credits

Biological sciences is an appropriate major for students interested in the science of life. Programs in these fields provide a broad education and a foundation in the basic principles of biology. Graduates are employed in environmental science, health services, biology education, and as field and laboratory technicians. Graduates may also pursue advanced MS, pharmacology, nursing, MD or PhD degrees. Biology faculty advisors can help students choose courses that will best fit their goals.

Biological sciences majors may pursue either a BA or BS degree. Because biology is an interdisciplinary science, both programs include course work in the physical sciences and mathematics. The BA requires fewer credits in biology and more credits in the social sciences and humanities than the BS degree, which focuses more intensively on biological science. The BS degree without a concentration provides the most comprehensive education in biology. The BS degree with a concentration permits some degree of specialization in one of three sub-disciplines: cell and molecular biology, physiology, or ecology and evolutionary biology.

Incoming students who do not meet the prerequisites for Fundamentals of Biology I (BIOL F115X) and those who did not complete a biology course in high school are encouraged to take a biology course for non-majors such as Biology and Society (BIOL F103X) or Natural History of Alaska (BIOL F104X) and General Chemistry I and II (CHEM F105X and CHEM F106X) during their first year, and to begin the BIOL F115X and F116X series in their sophomore year. Students unprepared for General Chemistry I (CHEM F105X) should take Basic General Chemistry (CHEM F103X) during their first year, and begin both the General Chemistry (CHEM F105X and F106X) and Fundamentals of Biology Series (BIOL F115X and F116X) during their sophomore year.

Students majoring in the biological sciences must complete a capstone project during their junior or senior year. The goal of the capstone experience is to integrate skills and information students have learned in previous courses by conducting a mentored research project and communicating the results. To fulfill the capstone requirement, a student may take either a designated capstone course or complete a mentored research project with a faculty member and petition the Biology and Wildlife chair to have this research experience count toward the capstone requirement. Biology course credit for mentored research may be obtained by completing BIOL F490, F397, or F497. More information about the capstone requirement is posted on the Biology and Wildlife website ([www.bw.uaf.edu](http://www.bw.uaf.edu)). Students are strongly encouraged to speak to a biology advisor well before their senior year about how they plan to satisfy the capstone requirement.

### Major — BA Degree

1. Complete the general university requirements. (See page 131. As part of the core curriculum requirements, complete: CHEM F105X\* and F106X\*.)
2. Complete the BA degree requirements (page 135). As part of the BA degree requirements, complete STAT F200X\*. As part of the humanities and social sciences requirement, take at least 9 credits of upper-division course work. As part of the minor, take at least 3 credits of upper-division course work.

3. Complete the following program (major) requirements:\*

- a. Complete the following:  
BIOL F115X—Fundamentals of Biology I .....4  
BIOL F116X—Fundamentals of Biology II .....4  
BIOL F260—Principles of Genetics .....4  
BIOL F481—Principles of Evolution .....4  
CHEM F321—Organic Chemistry .....4  
PHYS F103X—College Physics .....4
  - b. Complete two of the following three biology breadth requirements:\*\*  
BIOL F310—Animal Physiology (4)  
or BIOL F342—Microbiology (4)  
or BIOL F434W—Structure and Function of Vascular Plants (4)  
or BIOL F213X and F214X—Human Anatomy and Physiology I and II (8)..... 4 – 8  
BIOL F360—Cell and Molecular Biology .....3  
BIOL F371—Principles of Ecology .....4
  - c. Complete three elective courses from course lists A, B, C or D below, at least one of which is designated a W course.\*\*\* If possible, satisfy all UAF core requirements for W and O courses and the biology capstone requirement with these elective courses.
  - d. Complete a biology capstone project (no credit requirement):  
The capstone requirement can be met through a petition following the completion of a mentored research project with a faculty member (e.g., by taking BIOL F490, or BIOL F497, or without course credits), or by completing at least one of the following courses:  
BIOL F403W—Metabolism and Biochemistry (4)  
or BIOL F434W—Plant Structure and Function of Vascular Plants (4)  
or BIOL F441W/O/2—Animal Behavior (3)  
or BIOL F472W—Community Ecology (4)  
or BIOL F473W—Limnology (3) ..... 3 – 4
4. Minimum credits required .....120

### Major — BS Degree without concentration

1. Complete the general university requirements. (See page 131. As part of the core curriculum requirements, complete: MATH F200X\* or MATH F272X\*; and CHEM F105X\* and F106X\*.)
  2. Complete the BS degree requirements. (See page 136. As part of the BS degree requirements, complete STAT F200X\* or STAT F300\* and PHYS F103X\* and PHYS F104X\*.)
  3. Complete the following program (major) requirements:\*
- |                                                                                                                                                                                                            |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| BIOL F115X—Fundamentals of Biology I .....                                                                                                                                                                 | 4     |
| BIOL F116X—Fundamentals of Biology II .....                                                                                                                                                                | 4     |
| BIOL F260—Principles of Genetics .....                                                                                                                                                                     | 4     |
| BIOL F360—Cell and Molecular Biology .....                                                                                                                                                                 | 3     |
| BIOL F371—Principles of Ecology .....                                                                                                                                                                      | 4     |
| BIOL F310—Animal Physiology (4)<br>or BIOL F342—Microbiology (4)<br>or BIOL F213X and F214X—Human Anatomy and Physiology I and II (8)<br>or BIOL F434W—Structure and Function of Vascular Plants (4) ..... | 4 – 8 |
| BIOL F481—Principles of Evolution .....                                                                                                                                                                    | 4     |
| CHEM F321—Organic Chemistry I (4)<br>and either CHEM F322—Organic Chemistry II( 3)<br>or CHEM F451—General Biochemistry — Metabolism (3) ...                                                               | 3 – 4 |
4. Complete the following electives (at least one must satisfy the W requirement):\*\*\*  
**Organismal elective:**  
Complete one additional course from list D ..... 3 – 4  
**Biology electives:**  
Complete four additional courses at the 200 level or above, at least three of which must be from lists A, B, C or D.....2 – 16

5. Complete a biology capstone project (no credit requirement):  
The capstone requirement can be met through a petition following the completion of a mentored research project with a faculty member (e.g., by taking BIOL F490, or BIOL F497, or without course credits), or by completing at least one of the following courses:  
BIOL F403W—Metabolism and Biochemistry (4)  
or BIOL F434W—Structure and Function of Vascular Plants (4)  
or BIOL F441W,O/2—Animal Behavior (3)  
or BIOL F472W—Community Ecology (4)  
or BIOL F473W—Limnology (3)
6. Minimum credits required .....120

### Major — BS Degree with concentration

1. Complete the general university requirements. (See page 131. As part of the core curriculum requirements, complete: MATH F200X\* or MATH F272X\*; and CHEM F105X\* and F106X\*.)
2. Complete the BS degree requirements. (See page 136. As part of the BS degree requirements, complete STAT F200X\* or STAT F300\* and PHYS F103X\* and PHYS F104X\*.)
3. Complete the following program (major) requirements:
  - BIOL F115X—Fundamentals of Biology I .....4
  - BIOL F116X—Fundamentals of Biology II .....4
  - BIOL F260—Principles of Genetics .....4
  - BIOL F310—Animal Physiology (4)  
or BIOL F434W—Structure and Function of Vascular Plants (4)  
or BIOL F342—Microbiology (4)  
or BIOL F213X and F214X—Human Anatomy and Physiology I and II (8) ..... 4 – 8
  - BIOL F481—Principles of Evolution .....4
  - CHEM F321—Organic Chemistry I (4)  
and either CHEM F322—Organic Chemistry II (3)  
or CHEM F451—General Biochemistry — Metabolism (3) ... 3 – 4
4. Complete one of the following concentrations:\*\*\*.  
(When choosing courses to fulfill concentration requirements, students should consider the university requirement for two W courses and one O course, and the departmental requirement for a capstone project.)

#### a. Cell and Molecular Biology

- i. As part of the program requirements, complete CHEM F321.
  - ii. Complete the following (at least one of which must satisfy the W requirement):  
BIOL F360—Cell and Molecular Biology .....3  
CHEM F450—General Biochemistry — Macromolecules .....3  
CHEM F451—General Biochemistry — Metabolism .....3
- Cell and molecular and physiology electives:**  
Take three additional courses from lists A or B,  
at least one of which must be from list A ..... 9 – 12
- Biology breadth elective:**  
Take one additional course from lists C or D ..... 3 – 4

#### b. Physiology

- Complete the following (at least one of which must satisfy the W requirement):  
BIOL F360—Cell and Molecular Biology .....3
- Physiology or cell and molecular biology electives:**  
Take two courses from list A and two from list B .....12 – 16
- Biology breadth elective:**  
Take one additional course from lists C or D ..... 3 – 4
- Biology elective:**  
Take one additional course from lists A, B, C or D ..... 3 – 4

#### c. Ecology and Evolutionary Biology

- Complete the following (at least one of which must satisfy the W requirement):  
BIOL F371—Principles of Ecology .....4
- Ecology and evolutionary biology electives:**  
Take two additional courses from list C ..... 6 – 8
- Organismal elective:**  
Take one additional course from list D ..... 3 – 4

### Biology breadth elective:

Take one additional course from lists A or B ..... 3 – 4

### Biology elective:

Take one additional course from lists A, B, C or D ..... 3 – 4  
STAT F401—Regression and Analysis of Variance (4)  
or STAT F402—Scientific Sampling (3) ..... 3 – 4

5. Complete a biology capstone project (no credit requirement):  
The capstone requirement can be met through a petition following the completion of a mentored research project with a faculty member (e.g., by taking BIOL F490, or BIOL F497, with or without course credits), or by completing at least one of the following courses:  
BIOL F403W—Metabolism and Biochemistry (4)  
or BIOL F434W—Structure and Function of Vascular Plants (4)  
or BIOL F441W,O/2—Animal Behavior (3)  
or BIOL F472W—Community Ecology (4)  
or BIOL F473W—Limnology (3) ..... 3 – 4
6. Minimum credits required .....120

### Biology elective course lists:\*\*\*\*

#### • List A — Cell and Molecular Biology

BIOL F342—Microbiology .....3  
BIOL F360—Cell and Molecular Biology .....3  
BIOL F403W—Metabolism and Biochemistry .....4  
BIOL F417O—Neurobiology .....3  
BIOL F462O—Concepts of Infectious Disease .....3  
BIOL F465—Immunology .....3  
CHEM F322—Organic Chemistry II .....3  
CHEM F450—General Biochemistry — Macromolecules .....3  
CHEM F451—General Biochemistry — Metabolism .....3  
CHEM F470—Cellular and Molecular Neuroscience .....3  
CHEM F474—Neurochemistry .....3

#### • List B — Physiology

BIOL F310—Animal Physiology .....4  
BIOL F317—Comparative Anatomy .....4  
BIOL F335—Epidemiology .....3  
BIOL F342—Microbiology .....4  
BIOL F417O—Neurobiology .....3  
BIOL F422—Physiology and Ecology of Overwintering .....3  
BIOL F434W—Structure and Function in Vascular Plants .....4  
BIOL F441W,O/2—Animal Behavior .....3  
BIOL F455W,O—Environmental Toxicology .....3  
BIOL F457W,O—Environmental Microbiology .....3  
BIOL F458—Vertebrate Endocrinology .....3  
BIOL F459O/2—Wildlife Nutrition .....4  
BIOL F462O—Concepts of Infectious Disease .....3  
BIOL F465—Immunology .....3

#### • List C — Ecology and Evolutionary Biology

BIOL F371—Principles of Ecology .....4  
BIOL F418—Biogeography .....3  
BIOL F422—Physiology and Ecology of Overwintering .....3  
BIOL F433—Conservation Genetics .....3  
BIOL F441W,O/2—Animal Behavior .....3  
BIOL F457W—Environmental Microbiology .....3  
BIOL F462O—Concepts of Infectious Disease .....3  
BIOL F469O—Landscape Ecology and Wildlife Habitat .....3  
BIOL F471—Population Ecology .....3  
BIOL F472W—Community Ecology .....3  
BIOL F473W—Limnology .....3  
BIOL F474—Plant Ecology .....4  
BIOL F476O—Ecosystem Ecology .....3  
BIOL F483—Stream Ecology .....3  
BIOL F485—Global Change Ecology .....3  
BIOL F486—Vertebrate Paleontology .....3  
BIOL F487—Conceptual Issues in Evolutionary Biology .....3  
BIOL F488—Arctic Vegetation Ecology: Geobotany .....3  
BIOL F489—Vegetation Description and Analysis .....3  
WLF F301—Design of Wildlife Studies .....3  
WLF F410—Wildlife Populations and their Management .....3

• **List D — Organismal Biology**

BIOL F301—Biology of Fishes.....	4
BIOL F305—Invertebrate Zoology.....	4
BIOL F317—Comparative Anatomy .....	4
BIOL F331—Systematic Botany .....	4
BIOL F406—Entomology .....	4
BIOL F418—Biogeography .....	4
BIOL F425W—Mammalogy.....	3
BIOL F426W,O/2—Ornithology .....	3
BIOL F427—Ichthyology .....	4
BIOL F486—Vertebrate Paleontology.....	3
BIOL F489—Vegetation Description and Analysis.....	3

**Minor**

1. Complete the following program (minor) requirements:\*  
BIOL F115X—Fundamentals of Biology I.....4  
BIOL F116X—Fundamentals of Biology II .....4  
BIOL F260—Principles of Genetics .....4
2. Complete one of the following course options:\*\*\*\*  
BIOL F213X and F214X—Human Anatomy and Physiology I and II (8)  
or BIOL F310—Animal Physiology (4)

- or BIOL F342—Microbiology (4)  
or BIOL F360—Cell and Molecular Biology (3)  
or BIOL F371—Principles of Ecology (4)  
or BIOL F434W—Structure and Function of Vascular Plants (4)  
or BIOL F481—Principles of Evolution (4) ..... 3 – 8

3. Complete one additional course in biology at the 200-level or above.....3

4. Minimum credits required .....18

\* Students must earn a C or better in each course.

\*\* Because biology breadth courses for the BA degree serve as prerequisites for many upper-division biology electives, course choices should be made with consideration of the elective biology courses the student plans to complete.

\*\*\* Independent study (BIOL F397 or F497) or research experience (URSA F388 and F488, and BIOL F490) courses may be substituted by petition for a maximum of two required elective courses in biology (3 – 4 credits of independent study or research per substituted course). The subject area of the independent study or research will determine which biological subject areas the credits satisfy.

\*\*\*\* Courses that satisfy upper-division elective credit may require prerequisites in addition to the required biology course.

Note: A foreign language is encouraged by the department in meeting requirements of the core curriculum.

## Baccalaureate Core Requirements

### Communication . . . . . 9 Credits

- ENGL F111X—Introduction to Academic Writing.....(3)  
*ENGL F190H may be substituted.*

Complete one of the following:

- ENGL F211X—Academic Writing about Literature.....(3)
- ENGL F213X—Academic Writing about the Social and Natural Sciences.....(3)

Complete one of the following:

- COMM F131X—Fundamentals of Oral Communication: Group Context.....(3)
- COMM F141X—Fundamentals of Oral Communication: Public Context.....(3)

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### Perspectives on the Human Condition . . . . . 18 Credits

Complete all of the following four courses:

- ANTH F100X/SOC F100X—Individual, Society and Culture.....(3)
- ECON F100X or PS F100X—Political Economy.....(3)
- HIST F100X—Modern World History.....(3)
- ENGL/FL F200X—World Literature.....(3)

12

Complete one of the following three courses:

- ART/MUS/THR F200X—Aesthetic Appreciation: Interrelationship of Art, Drama and Music.....(3)
- HUM F201X—Unity in the Arts.....(3)
- ANS F202X—Aesthetic Appreciation of Alaskan Native Performance.....(3)

3

Complete one of the following six courses:

- BA F323X—Business Ethics.....(3)
- COMM F300X—Communicating Ethics.....(3)
- JUST F300X—Ethics and Justice.....(3)
- NRM F303X—Environmental Ethics and Actions.....(3)
- PS F300X—Ethics and Society.....(3)
- PHIL F322X—Ethics.....(3)

3

Or complete 12 credits from the above courses plus one of the following:

- Two semester-length courses in a single Alaska Native language or other non-English language
- Three semester-length courses (9 credits) in American Sign Language taken at the university level.

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### Mathematics . . . . . 3 Credits

Complete one of the following:

- MATH F103X—Concepts and Contemporary Applications of Mathematics.....(3)
  - MATH F107X—Functions for Calculus\*.....(4)
  - MATH F161X—Algebra for Business and Economics\*\*.....(3)
  - STAT F200X—Elementary Probability and Statistics.....(3)
- \* No credit may be earned for more than one of MATH F107X or F161X.

Or complete one of the following:\*

- MATH F200X—Calculus I\*\*.....(4)
- MATH F201X—Calculus II.....(4)
- MATH F202X—Calculus III.....(4)
- MATH F262X—Calculus for Business and Economics.....(4)
- MATH F272X—Calculus for Life Sciences.....(4)

\* Or any math course having one of these as a prerequisite

\*\* No credit may be earned for more than one of Math F200X, F262X or F272.

3 – 4

### Natural Sciences . . . . . 8 Credits

Complete any two (4-credit) courses.

- ATM F101X—Weather and Climate of Alaska.....(4)
- BIOL F100X—Human Biology.....(4)
- BIOL F101X—Biology of Sex.....(4)
- BIOL F103X—Biology and Society.....(4)
- BIOL F104X—Natural History.....(4)
- BIOL F115X—Fundamentals of Biology I.....(4)
- BIOL F116X—Fundamentals of Biology II.....(4)
- BIOL F120X—Introduction to Human Nutrition.....(4)
- BIOL F213X—Human Anatomy and Physiology I.....(4)
- BIOL F214X—Human Anatomy and Physiology II.....(4)
- CHEM F100X—Chemistry in Complex Systems.....(4)
- CHEM F103X—Basic General Chemistry.....(4)
- CHEM F104X—Beginnings in Biochemistry.....(4)
- CHEM F105X—General Chemistry.....(4)
- CHEM F106X—General Chemistry.....(4)
- GEOG F111X—Earth and Environment: Elements of Physical Geography.....(4)
- GEOS F100X—Introduction to Earth Science.....(4)
- GEOS F101X—The Dynamic Earth.....(4)
- GEOS F106X—Life and the Age of Dinosaurs.....(4)
- GEOS F112X—History of Earth and Life.....(4)
- GEOS F120X—Glaciers, Earthquakes and Volcanoes.....(4)
- GEOS F125X—Humans, Earth and Environment.....(4)
- MSL F111X—The Oceans.....(4)
- PHYS F102X—Energy and Society.....(4)
- PHYS F103X—College Physics.....(4)
- PHYS F104X—College Physics.....(4)
- PHYS F115X—Physical Science I.....(4)
- PHYS F175X—Astronomy.....(4)
- PHYS F211X—General Physics.....(4)
- PHYS F212X—General Physics.....(4)
- PHYS F213X—Elementary Modern Physics.....(4)

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### Library and Information Research . . . . . 0 – 1 Credit

- Successful completion of library skills competency test or LS F100X or LS F101X prior to junior standing

0 – 1

### Upper-Division Writing and Oral Communication

Complete the following at the upper-division level:

- Two writing intensive courses designated (W) and one oral communication intensive course designated (O), or two oral communication intensive courses designated (O/2) (see degree and/or major requirements)

Total credits required 38 – 39

All degrees (e.g. B.A., B.S., etc.) require additional courses.

Refer to specific degree and program requirements.

Students must earn a C- grade or better in each course used toward the baccalaureate core.