Duluth Campus

Biology B.A.

Biology

Swenson College of Science and Engineering

- Program Type: Baccalaureate
- Requirements for this program are current for Fall 2017
- Required credits to graduate with this degree: 120
- Required credits within the major: 70 to 72
- Degree: Bachelor of Arts

Biology has long been recognized as basic to environment, agriculture, and medicine. Because the topics studied by biologists range from sub-cellular particles to global environmental concerns, and because of the variety of living organisms and the various ways of studying them, many specialties have developed. The BA program provides majors with the necessary background to pursue careers in the diverse areas of life science, including health care professions, and the many careers that provide the interface between science and society.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

For information about University of Minnesota admission requirements, visit the Office of Admissions website.

Required prerequisites

Introductory Requirement (1 cr)

Transfer students with 24 or more credits and current students who change from a BS degree or change colleges may request to be waived from this requirement. New first-year students with 24 or more PSEO credits may request to be waived from this requirement.

UST 1000 - Learning in Community (1.0 - 2.0 cr)

General Requirements

The Board of Regents, on recommendation of the faculty, grants degrees from the University of Minnesota. Requirements for an undergraduate degree from University of Minnesota Duluth include the following:

1. Students must meet all course and credit requirements of the departments and colleges or schools in which they are enrolled including an advanced writing course. Students seeking two degrees must fulfill the requirements of both degrees. However, two degrees cannot be awarded for the same major.
2. Students must complete all requirements of the Liberal Education Program.
3. Students must complete a minimum of 120 semester credits.
4. At least 30 of the last 60 degree credits earned immediately before graduation must be awarded by UMD.
5. Students must complete at least half of their courses at the 3xxx-level and higher at UMD. Study-abroad credits earned through courses taught by UM faculty and at institutions with which UMD has international exchange programs may be used to fulfill this requirement.
6. If a minor is required, students must take at least three upper division credits in their minor field from UMD.
7. The minimum cumulative UM GPA required for graduation will be 2.00 and will include only University of Minnesota coursework. A minimum UM GPA of 2.00 is required in each UMD undergraduate major and minor. No academic unit may impose higher grade point standards to graduate.
8. Diploma, transcripts, and certification will be withheld until all financial obligations to the University have been met.

Program Requirements

1. The human biology sub-plan requires a minor or second major from another area of study outside the Department of Biology with the exception of the natural history minor. The life science sub-plan requires a minor or second major from a non-SCSE program.

Biology BA Core Courses (18 cr)

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General Biology I
BIOL 1013 *{Inactive}*[NAT SCI] (5.0 cr)
General Biology II
BIOL 1012 - General Biology II [SUSTAIN] (5.0 cr)
Additional Biology
BIOL 2201 - Genetics (3.0 cr)
BIOL 3987 - Communication in Biology (2.0 cr)
Ecology
BIOL 2410 - Ecology and Evolution (3.0 cr)
or BIOL 2801 - General Ecology (3.0 cr)
or BIOL 3401 - Evolution (3.0 cr)

Chemistry (10 cr)
Introduction to Organic and Biological Chem I and II
CHEM 1113 - Introduction to General, Organic, and Biological Chemistry I [LE CAT, NAT SCI] (5.0 cr)
CHEM 1114 - Introduction to General, Organic, and Biological Chemistry II (5.0 cr)
or **Chemistry I and II with labs**
CHEM 1153 - General Chemistry I [LE CAT, NAT SCI] (4.0 cr)
CHEM 1154 - General Chemistry Lab I [LE CAT, NAT SCI] (1.0 cr)
CHEM 1155 - General Chemistry II (4.0 cr)
CHEM 1156 - General Chemistry Lab II (1.0 cr)

Mathematics and Statistics (7 - 9 cr)
Mathematics
MATH 1250 - Precalculus Analysis [LE CAT2, LOGIC & QR] (4.0 cr)
or MATH 1290 - Calculus for the Natural Sciences [LE CAT2, LOGIC & QR] (5.0 cr)
or MATH 1296 - Calculus I [LE CAT, LOGIC & QR] (5.0 cr)
or MATH 1160 - Finite Mathematics and Introduction to Calculus [LE CAT, LOGIC & QR] (5.0 cr)
Statistics
STAT 1411 - Introduction to Statistics [LE CAT, LOGIC & QR] (3.0 cr)
or STAT 24xx or above (3 - 4 cr)
or PSY 3020 - Statistical Methods (4.0 cr)
or ECON 2030 - Applied Statistics for Business and Economics [LOGIC & QR] (3.0 cr)

Advanced Writing Requirement (3 cr)
BIOL 3011 can count toward Biology SBE electives if there has been a previous completion of either WRIT 3150 or BIOL 3011.
WRIT 3150 - Advanced Writing: Science (3.0 cr)
or BIOL 3011 - Writing for the Duluth Journal of Undergraduate Biology (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.

Human Biology
The biology bachelor of arts in human biology is designed to provide the breadth and depth of knowledge required for students entering human health care professions including nursing, dentistry, pharmacy, physician assistant, and the diverse array of health care technician programs. The core courses in biology, chemistry, physics, and mathematics provide a strong foundation for more specialized upper division coursework. Students will complete their degree with upper division electives from the life, physical, and social sciences and humanities to focus their degree toward their professional goals. Please visit the Biology Department webpage http://www.d.umn.edu/biology/ for example plans.

Human Biology Core (13 cr)
BIOL 3100 - Cell Biology (3.0 cr)
BIOL 3771 - Human Anatomy (4.0 cr)
BIOL 3772 - Human Physiology (4.0 cr)
BIOL 2102 - Cell Biology Laboratory (2.0 cr)
or BIOL 2202 - Genetics Laboratory (2.0 cr)
Biology BA Electives (6 cr)
Between the biology electives and additional electives, at least one biology lab course must be included.
Cell Biology (CELL)
BIOL 4361, and 5232 carry a lab component
Take 2 or more course(s) totaling 6 or more credit(s) from the following:
•BIOL 3512 - Biology of HIV and AIDS (3.0 cr)
•BIOL 3101 - Molecular Biology of Cancer (3.0 cr)
•BIOL 3102 - Cell Biology of Human Disease (3.0 cr)

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- BIOL 3301 - Patterning the Embryo (3.0 cr)
- BIOL 4199 - Frontiers in Cell Biology (3.0 cr)
- BIOL 4231 - Molecular Biology (3.0 cr)
- BIOL 4361 - Developmental Biology (3.0 cr)
- BIOL 4511 - Medical Microbiology (3.0 cr)
- BIOL 4631 *{Inactive}*(3.0 cr)
- BIOL 4232 - Molecular Biology Laboratory (2.0 cr)
- BIOL 5511 *{Inactive}*(3.0 cr)
- BMS 5545 - Immunology (3.0 cr)

Additional Electives (12 cr)

Between the Biology BA Electives and Additional Electives, at least one Biology Lab course must be included. Courses cannot be used to fulfill more than 1 requirement within the major.

Take 12 or more credit(s) from the following:

Electives

BIOL 2571 carries a lab component.

Take 0 or more course(s) from the following:

- ANTH 2xxx
- ANTH 3xxx
- ANTH 4xxx
- BIOL 2571 - Microbiology for Human Health (4.0 cr)
- BMS 5501 - Neurobiochemistry (2.0 cr)
- BMS 5555 - Molecular Pathogenesis: Current Concepts (3.0 cr)
- BMS 5601 - Grand Challenges in Physiology (3.0 cr)
- BMS 5602 - Physiology of Organ Systems II (2.0 cr)
- CHEM 2541 - Organic Chemistry I (3.0 cr)
- CHEM 2542 - Organic Chemistry II (3.0 cr)
- CHEM 2543 - Organic Chemistry I Laboratory (1.0 cr)
- CHEM 2544 - Organic Chemistry II Laboratory (1.0 cr)
- CHEM 3322 - Biochemistry (3.0 cr)
- CHEM 3324 - Biochemistry Laboratory (1.0 cr)
- PSY 3xxx
- PSY 4xxx
- PSY 5xxx
- SOC 2xxx
- SOC 3xxx
- SOC 4xxx

- **Physics I Electives**

Take 0 or more course(s) from the following:

Physics I course

PHYS 1001 - Introduction to Physics I [LE CAT, NAT SCI] (5.0 cr)
or PHYS 2013 - General Physics I [LE CAT, NAT SCI] (4.0 cr)
or PHYS 2017 - Honors: General Physics I [NAT SCI] (4.0 cr)

Physics I lab

Students who take PHYS 2013 or 2017 MUST take PHYS 2014 to complete the Physics I requirement.

Students who take PHYS 1001 DO NOT have to take PHYS 2014.
PHYS 2014 - General Physics Lab I [NAT SCI] (1.0 cr)

- **Physics II Electives**

Take 0 or more course(s) from the following:

Physics II course

PHYS 1002 - Introduction to Physics II (5.0 cr)
or PHYS 2015 - General Physics II (4.0 cr)
or PHYS 2018 - Honors General Physics II (4.0 cr)

Physics II lab

PHYS 2016 - General Physics Lab II (1.0 cr)

- **Anatomy, Morphology, Physiology Electives (AMP)**

BIOL 3703 and 4604 carry a lab component

Take 0 or more course(s) from the following:

- BIOL 3703 - Animal Physiology (3.0 cr)
- BIOL 4604 - Plant Physiology (4.0 cr)
- BIOL 5772 - Neural Systems and Behavior (3.0 cr)

- **Cell Biology Electives (CELL)**

BIOL 4361 and 5232 carry a lab component

Take 0 or more course(s) from the following:

- BIOL 3512 - Biology of HIV and AIDS (3.0 cr)
- BIOL 3101 - Molecular Biology of Cancer (3.0 cr)

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- BIOL 3102 - Cell Biology of Human Disease (3.0 cr)
- BIOL 3301 - Patterning the Embryo (3.0 cr)
- BIOL 4199 - Frontiers in Cell Biology (3.0 cr)
- BIOL 4361 - Developmental Biology (3.0 cr)
- BIOL 4511 - Medical Microbiology (3.0 cr)
- BIOL 4631 *{Inactive}*(3.0 cr)
- BIOL 5511 *{Inactive}*(3.0 cr)
- BMS 5545 - Immunology (3.0 cr)

•Diversity and Taxonomy Electives (DT)

All courses in this category carry a lab component

Take 0 or more course(s) from the following:

- BIOL 3502 - General Microbiology (4.0 cr)
- BIOL 3601 - Plant Diversity (3.0 cr)
- BIOL 3603 - Plant Taxonomy (3.0 cr)
- BIOL 3701 - Animal Diversity (4.0 cr)
- BIOL 4731 - Entomology (3.0 cr)
- BIOL 4761 - Ichthyology (3.0 cr)
- BIOL 4763 - Ornithology (3.0 cr)
- BIOL 4764 - Mammalogy (3.0 cr)
- BIOL 5515 - Microbial Diversity and Phylogeny (3.0 cr)

•Ecology, Evolution & Behavior Electives (EEB)

BIOL 3761, 3811 and 4839 carry a lab component.

Take 0 or more course(s) from the following:

- BIOL 3401 - Evolution (3.0 cr)
- BIOL 3402 *{Inactive}*(1.0 cr)
- BIOL 3760 - Marine Biology (3.0 cr)
- BIOL 3761 - Field Studies in Marine Biology (4.0 cr)
- BIOL 3811 *{Inactive}*(4.0 cr)
- BIOL 3830 *{Inactive}*(3.0 cr)
- BIOL 3835 - Freshwater Ecology (3.0 cr)
- BIOL 4201 - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
- BIOL 4233 *{Inactive}*(3.0 cr)
- BIOL 4818 - Biotic Response to Climate Change (3.0 cr)
- BIOL 4839 - Coral Reef Field Studies [GLOBAL PER] (3.0 cr)
- BIOL 4850 - Food and Humans (3.0 cr)
- BIOL 4891 - Animal Behavior (3.0 cr)
- BIOL 4992 - Senior Seminar: Classic Readings in Natural History (1.0 cr)
- BIOL 5201 - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
- BIOL 5240 - Ecological Genetics (3.0 cr)
- BIOL 5777 *{Inactive}*(2.0 cr)
- BIOL 5801 - Microbial Ecology (2.0 cr)
- BIOL 5805 - Fisheries Ecology and Management (3.0 cr)
- BIOL 5808 *{Inactive}*(3.0 cr)
- BIOL 5809 - Ecological Statistics (3.0 cr)
- BIOL 5818 - Biotic Response to Climate Change (3.0 cr)
- BIOL 5833 - Stream Ecology (3.0 cr)
- BIOL 5861 - Lake Ecology (3.0 cr)
- BIOL 5865 - Conservation Biology (2.0 cr)
- BIOL 5870 - Wetland Ecology (3.0 cr)

•Supplemental Biology Electives (SBE)

These courses can be used as additional electives only if they have not been used in the core. 2 cr of SSP 3002 TA Practicum (in Biology) may be substituted for BIOL 3993 as an upper division elective with departmental approval. A maximum of 2 cr BIOL 3993, a maximum of 4 cr BIOL 3994 and a maximum of 1 cr BIOL 3996 may be applied to the degree. BIOL 2102, 2202, and 2802 carry a lab component. BIOL 3011 can count if there has been a previous completion of either WRIT 3150 or BIOL 3011.

Take 0 or more course(s) from the following:

- BIOL 2102 - Cell Biology Laboratory (2.0 cr)
- BIOL 2202 - Genetics Laboratory (2.0 cr)
- BIOL 2802 - Ecology Laboratory (2.0 cr)
- BIOL 3001 *{Inactive}*(3.0 cr)
- BIOL 3011 - Writing for the Duluth Journal of Undergraduate Biology (3.0 cr)
- BIOL 3993 - Laboratory Teaching Experience (1.0 - 2.0 cr)
- BIOL 3994 - Undergraduate Research (1.0 - 3.0 cr)
- BIOL 3996 - Internship in Biology (1.0 - 2.0 cr)
- BIOL 5001 - Teaching and Learning in the Life Sciences (1.0 cr)

•Social Science, Business & Humanities Electives (SBH)

Take 0 or more course(s) from the following:

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•ANTH 1602 - Biological Anthropology and Archaeology [LE CAT, SOC SCI] (4.0 cr)
•ECON 1003 - Economics and Society [LE CAT, SOC SCI] (3.0 cr)
•HIST 2350 - Hunting and Gathering and the History of American Health [HUMANITIES, SUSTAIN] (4.0 cr)
•MGTS 1101 - Introduction to Business [LE CAT8] (3.0 cr)
•PHIL 1003 - Ethics and Society [LE CAT8, LEIP CAT08, HUMANITIES, CDIVERSITY] (3.0 cr)
•PSY 1003 - General Psychology [LE CAT, SOC SCI] (4.0 cr)
•PSY 2021 - Developmental Psychology [LE CAT, LECD C, SOC SCI, CDIVERSITY] (3.0 cr)
•PSY 3121 - Abnormal Psychology (3.0 cr)
•SOC 1101 - Introduction to Sociology [LE CAT, LECD C, SOC SCI, CDIVERSITY] (4.0 cr)

Life Sciences

The life sciences sub-plan is for students whose educational and career objectives can best be met by integrating a strong biology background with courses from multiple departments in order to complete a second major or minor outside the Swenson College of Science and Engineering. Please visit the Biology Department webpage http://www.d.umn.edu/biology/ for example plans.

Life Science Core Courses (5 cr)
BIOL 2110 - Cell and Molecular Biology (3.0 cr)
or BIOL 3100 - Cell Biology (3.0 cr)
BIOL 2102 - Cell Biology Laboratory (2.0 cr)
or BIOL 2202 - Genetics Laboratory (2.0 cr)
or BIOL 2802 - Ecology Laboratory (2.0 cr)

Biology BA Elective Categories (26 cr)
Courses cannot be used to fulfill more than 1 requirement in the major. Must include a minimum of 17 credits BIOL 3xxx or above and 3 biology lab courses.

Take 26 or more credit(s) from the following:

Anatomy, Morphology, Physiology (AMP)
BIOL 3703, 3771, 3772 and 4604 carry a lab component.
Take 0 or more course(s) from the following:
•BIOL 3703 - Animal Physiology (3.0 cr)
•BIOL 3771 - Human Anatomy (4.0 cr)
•BIOL 3772 - Human Physiology (4.0 cr)
•BIOL 4604 - Plant Physiology (4.0 cr)
•BIOL 5772 - Neural Systems and Behavior (3.0 cr)

Cell Biology (CELL)
BIOL 4361, and 5232 carry a lab component.
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
•BIOL 3512 - Biology of HIV and AIDS (3.0 cr)
•BIOL 3100 - Cell Biology (3.0 cr)
•BIOL 3101 - Molecular Biology of Cancer (3.0 cr)
•BIOL 3102 - Cell Biology of Human Disease (3.0 cr)
•BIOL 3301 - Patterning the Embryo (3.0 cr)
•BIOL 4199 - Frontiers in Cell Biology (3.0 cr)
•BIOL 4361 - Developmental Biology (3.0 cr)
•BIOL 4511 - Medical Microbiology (3.0 cr)
•BIOL 4631 *{Inactive}*(3.0 cr)
•BIOL 4232 - Molecular Biology Laboratory (2.0 cr)
•BIOL 5511 *{Inactive}*(3.0 cr)
•BMS 5545 - Immunology (3.0 cr)

Diversity and Taxonomy (DT)
All courses in this category carry a lab component.
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
•BIOL 3502 - General Microbiology (4.0 cr)
•BIOL 3601 - Plant Diversity (3.0 cr)
•BIOL 3603 - Plant Taxonomy (3.0 cr)
•BIOL 3701 - Animal Diversity (4.0 cr)
•BIOL 4731 - Entomology (3.0 cr)
•BIOL 4761 - Ichthyology (3.0 cr)
•BIOL 4763 - Ornithology (3.0 cr)
•BIOL 4764 - Mammalogy (3.0 cr)
•BIOL 5515 - Microbial Diversity and Phylogeny (3.0 cr)

Ecology, Evolution and Behavior (EEB)
BIOL 3761, 3811, and 4839 carry a lab component.
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
•BIOL 3401 - Evolution (3.0 cr)
•BIOL 3402 *{Inactive}*(1.0 cr)

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- BIOL 3760 - Marine Biology (3.0 cr)
- BIOL 3761 - Field Studies in Marine Biology (4.0 cr)
- BIOL 3811 *{Inactive}*(4.0 cr)
- BIOL 3830 *{Inactive}*(3.0 cr)
- BIOL 3835 - Freshwater Ecology (3.0 cr)
- BIOL 4201 - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
- BIOL 4233 *{Inactive}*(3.0 cr)
- BIOL 4818 - Biotic Response to Climate Change (3.0 cr)
- BIOL 4839 - Coral Reef Field Studies [GLOBAL PER] (3.0 cr)
- BIOL 4850 - Food and Humans (3.0 cr)
- BIOL 4891 - Animal Behavior (3.0 cr)
- BIOL 4992 - Senior Seminar: Classic Readings in Natural History (1.0 cr)
- BIOL 5201 - Leverage bioinformatic tools to manage big data and answer primary biology questions (3.0 cr)
- BIOL 5240 - Ecological Genetics (3.0 cr)
- BIOL 5777 *{Inactive}*(2.0 cr)
- BIOL 5801 - Microbial Ecology (2.0 cr)
- BIOL 5805 - Fisheries Ecology and Management (3.0 cr)
- BIOL 5808 *{Inactive}*(3.0 cr)
- BIOL 5809 - Ecological Statistics (3.0 cr)
- BIOL 5818 - Biotic Response to Climate Change (3.0 cr)
- BIOL 5833 - Stream Ecology (3.0 cr)
- BIOL 5861 - Lake Ecology (3.0 cr)
- BIOL 5865 - Conservation Biology (2.0 cr)
- BIOL 5870 - Wetland Ecology (3.0 cr)

Supplemental Biology Electives (SBE)

These courses can be used as additional electives only if they have not been used in the core. 2 cr of SSP 3002 TA Practicum (in Biology) may be substituted for BIOL 3993 as an upper division elective with departmental approval. A maximum of 2 cr BIOL 3993, a maximum of 4 cr BIOL 3994 and a maximum of 1 cr BIOL 3996 may be applied to the degree. BIOL 2102, 2202 and 2802 carry a lab component. BIOL 3011 can count if there has been a previous completion of either WRIT 3150 or BIO 3011.

Take 0 or more course(s) from the following:

- BIOL 2102 - Cell Biology Laboratory (2.0 cr)
- BIOL 2202 - Genetics Laboratory (2.0 cr)
- BIOL 2801 - General Ecology (3.0 cr)
- BIOL 2802 - Ecology Laboratory (2.0 cr)
- BIOL 3001 *{Inactive}*(3.0 cr)
- BIOL 3011 - Writing for the Duluth Journal of Undergraduate Biology (3.0 cr)
- BIOL 3993 - Laboratory Teaching Experience (1.0 - 2.0 cr)
- BIOL 3994 - Undergraduate Research (1.0 - 3.0 cr)
- BIOL 3996 - Internship in Biology (1.0 - 2.0 cr)
- BIOL 5001 - Teaching and Learning in the Life Sciences (1.0 cr)

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