Twin Cities Campus

Cellular and Organismal Physiology B.S.

College of Biological Sciences - Adm

College of Biological Sciences

- Program Type: Baccalaureate
- Requirements for this program are current for Spring 2021
- Required credits to graduate with this degree: 120
- Required credits within the major: 78 to 86
- Degree: Bachelor of Science

Physiology is a unique field that studies the mechanisms of cells, organs, tissues, and organisms, incorporating concepts and approaches especially from physics, genetics, and biochemistry. Physiology is oriented to "understanding how biological systems function" and therefore is a natural pre-med major. The physiology BS is a broad-based physiology major and is excellent preparation for medical school, dental school, veterinarian school, and graduate school in a variety of biological disciplines. The physiology BS shares a core set of chemistry, math, physics, and biology courses required for all CBS students. This allows students to switch majors within CBS without losing credits towards graduation through their second year. This also promotes core competency in CBS graduates and promotes community within the CBS student body since students take classes together. The biology core includes the foundations of biology series, molecular biology and society, biochemistry, genetics, and cell biology. In addition, students are exposed to the physiology of the entire range of organisms from bacteria to plants, fungi, animals, and humans.

Program Delivery

This program is available:

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

Admission Requirements

A GPA above 2.0 is preferred for the following:

- 2.50 transferring from another University of Minnesota college
- 2.50 transferring from outside the University

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

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the liberal education requirements.Required courses for the major or minor in which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

At least 17 upper division credits in the major must be taken at the University of Minnesota Twin Cities campus.

Foundational Courses

Nature of Life/Nature of Science and Research

BIOL 1805 - Nature of Life: Introducing New Students to the Biological Sciences (0.5 cr)
BIOL 1806 - Nature of Life, Part Two (0.5 cr)
BIOL 2905 - Nature of Life, Part III (0.5 cr)
BIOL 2906 - Nature of Life, Part IV (0.5 cr)
or This track (BIOL 3001) is for transfer students only.
BIOL 3001 - Nature of Science and Research (1.0 cr)

Foundations of Biology

BIOL 1951 - Foundations of Biology Lecture I for Biological Sciences Majors [BIOL] (4.0 cr)
or BIOL 1951H - Foundations of Biology Lecture I for Biological Sciences Majors [BIOL] (4.0 cr)
BIOL 1961 - Foundations of Biology Lab I for Biological Sciences Majors [BIOL] (2.0 cr)
BIOL 2003 - Foundations of Biology for Biological Sciences Majors, Part II (3.0 cr)
or BIOL 2003H - Foundations of Biology for Biological Sciences Majors, Part II (3.0 cr)
BIOL 3004 - Foundations of Biology for Biological Sciences Majors, Part II Laboratory (3.0 cr)

Quantitative Requirements

MATH 1241 - Calculus and Dynamical Systems in Biology [MATH] (4.0 cr)
or MATH 1271 - Calculus I [MATH] (4.0 cr)
or MATH 1371 - CSE Calculus I [MATH] (4.0 cr)

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or MATH 1571H - Honors Calculus I [MATH] (4.0 cr)
Take 1 or more course(s) from the following:
•CSCI 1133 - Introduction to Computing and Programming Concepts (4.0 cr)
•CSCI 1133H - Honors Introduction to Computing and Programming Concepts (4.0 cr)
•CSCI 3003 - Introduction to Computing in Biology (3.0 cr)
•MATH 1272 - Calculus II (4.0 cr)
•MATH 1572H - Honors Calculus II (4.0 cr)
•MATH 2241 - Mathematical Modeling of Biological Systems (3.0 cr)
•STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
•BIOL 3272 - Applied Biostatistics (4.0 cr)
or BIOL 3272H - Applied Biostatistics (4.0 cr)
or BIOL 5272 - Applied Biostatistics (4.0 cr)

Chemistry

Track 1: Preferred CBS Chemistry Sequence
CHEM 1081 - Chemistry for the Life Sciences I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
CHEM 1082 - Chemistry for the Life Sciences II (3.0 cr)
CHEM 1086 - Chemistry for the Life Sciences II Laboratory (1.0 cr)
CHEM 2081 - Chemistry for the Life Sciences III (3.0 cr)
CHEM 2085 - Chemistry for the Life Sciences III Laboratory (2.0 cr)
or **Track 2**
This track is allowable for students entering CBS with previous chemistry credit, or for whom space is not available in the preferred track. Students should speak with a CBS academic advisor to determine eligibility for this track.
CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
CHEM 2301 - Organic Chemistry I (3.0 cr)
CHEM 2302 - Organic Chemistry II (3.0 cr)
or **Track 2 (Honors Option)**
This track is allowable for CBS honors students.
CHEM 1071H - Honors Chemistry I [PHYS] (3.0 cr)
CHEM 1075H - Honors Chemistry I Laboratory [PHYS] (1.0 cr)
CHEM 1072H - Honors Chemistry II [PHYS] (3.0 cr)
CHEM 1076H - Honors Chemistry II Laboratory [PHYS] (1.0 cr)
CHEM 2331H - Honors Elementary Organic Chemistry I (3.0 cr)
CHEM 2332H - Honors Elementary Organic Chemistry II (3.0 cr)

Physics
PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1221 - Introductory Physics for Life Science Majors I [PHYS] (4.0 cr)
or PHYS 1301W - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
or PHYS 1401V - Honors Physics I [PHYS, WI] (4.0 cr)
PHYS 1202W *{Inactive}*[PHYS, WI] (5.0 cr)
or PHYS 1222 - Introductory Physics for Life Science Majors II [PHYS] (4.0 cr)
or PHYS 1302W - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)
or PHYS 1402V - Honors Physics II [PHYS, WI] (4.0 cr)

Molecular and Cellular Biology
BIOL 3015 - Molecular Biology (2.0 cr)
or BIOL 3025 - Molecular Biology and Society [TS] (3.0 cr)
BIOC 3022 - Biochemistry for Life Scientists (3.0 cr)
or BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
BIOL 4003 - Genetics (3.0 cr)
BIOL 4004 - Cell Biology (3.0 cr)

Ecology, Evolution, and Biodiversity
PMB 3007W - Plant, Algal, and Fungal Diversity and Adaptation [WI] (4.0 cr)
or PMB 3002 - Plant Biology: Function (2.0 cr)
PMB 3005W - Plant Function Laboratory [WI] (2.0 cr)
or EEB 3407 - Ecology (3.0 cr)
or EEB 3408W - Ecology [WI] (4.0 cr)
or EEB 3807 - Ecology (4.0 cr)
or EEB 3409 - Evolution (3.0 cr)
or EEB 5409 - Evolution (3.0 cr)
or EEB 3411 - Introduction to Animal Behavior (3.0 cr)
or EEB 3412W - Introduction to Animal Behavior, Writing Intensive [WI] (4.0 cr)

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or EEB 3811W - Animal Behavior in the Field [WI] (4.0 cr)

Cellular and Organismal Physiology Major-Specific Coursework

MICB 3301 - Biology of Microorganisms (5.0 cr)
PHSL 3051 - Human Physiology (4.0 cr)
BIOL 3211 - Physiology of Humans and Other Animals (3.0 cr)
BIOL 2005 - Animal Diversity Laboratory (2.0 cr)
PMB 4111 - Microbial Physiology and Diversity (3.0 cr)
or PMB 4412 - Plant Physiology and Development (3.0 cr)
or PMB 5412 - Plant Physiology and Development (3.0 cr)

Cellular and Organismal Physiology Major Electives

A total of 6 major elective credits are required. A maximum of one Other Elective Options courses can be taken toward the 6 credits. A maximum of four directed research/studies credits can be taken toward the 6 credits of major electives. A maximum of seven directed research credits may be counted toward the degree overall. Note: while some of these courses appear as options in other areas of the major, any individual course may only fulfill one major requirement.

Take 6 or more credit(s) from the following:

Physiology Major Electives

The following courses can be used for physiology major elective credit, if not used to fulfill any other major requirements.

Take 6 or more credit(s) from the following:

- BIOC 4025W - Laboratory in Biochemistry [WI] (2.0 cr)
- BIOC 4125 - Laboratory in Molecular Biology and Biotechnology (3.0 cr)
- BIOC 5444 - Muscle (3.0 cr)
- BIOL 3503 - Biology of Aging (2.0 cr)
- BIOL 5309 - Molecular Ecology And Ecological Genomics (3.0 cr)
- CSCI 3003 - Introduction to Computing in Biology (3.0 cr)
- EEB 3409 - Evolution (3.0 cr)
- EEB 4068 - Plant Physiological Ecology (3.0 cr)
- EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
- EEB 5605 *{Inactive}*(2.0 cr)
- FNRM 3104 - Forest Ecology (4.0 cr)
- GCD 4025 - Cell Biology, Development & Regeneration Laboratory (3.0 cr)
- GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
- GCD 4111 - Histology: Cell and Tissue Organization (4.0 cr)
- GCD 4161 - Developmental Biology (3.0 cr)
- GCD 5036 - Molecular Cell Biology (3.0 cr)
- MATH 2241 - Mathematical Modeling of Biological Systems (3.0 cr)
- MICB 4131 - Immunology (3.0 cr)
- MICB 4161W - Eukaryotic Microbiology [WI] (3.0 cr)
- MICB 4215 - Advanced Laboratory: Microbial Physiology and Diversity (3.0 cr)
- MICB 4225W - Advanced Laboratory: Microbial Genetics [WI] (3.0 cr)
- NSCI 3101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
- NSCI 3102W - Neurobiology II: Perception and Behavior [WI] (3.0 cr)
- NSCI 4105 - Neurobiology Laboratory I (3.0 cr)
- PLPA 5203 - Introduction to Fungal Biology (3.0 cr)
- PMB 3002 - Plant Biology: Function (2.0 cr)
- PMB 3005W - Plant Function Laboratory [WI] (2.0 cr)
- PMB 4111 - Microbial Physiology and Diversity (3.0 cr)
- PMB 4516W - Plant Cell Biology: Writing Intensive [WI] (3.0 cr)
- PMB 4601 - Topics in Plant Biochemistry (3.0 cr)
- BIOL 3272 - Applied Biostatistics (4.0 cr)
  or BIOL 5272 - Applied Biostatistics (4.0 cr)
- PMB 4412 - Plant Physiology and Development (3.0 cr)
  or PMB 5412 - Plant Physiology and Development (3.0 cr)
- EEB 3407 - Ecology (3.0 cr)
  or EEB 3408W - Ecology [WI] (4.0 cr)
  or EEB 3807 - Ecology (4.0 cr)
- EEB 3411 - Introduction to Animal Behavior (3.0 cr)
  or EEB 3412W - Introduction to Animal Behavior, Writing Intensive [WI] (4.0 cr)
  or EEB 3811W - Animal Behavior in the Field [WI] (4.0 cr)
- PMB 3212 - Fungi - A Kingdom of Their Own (3.0 cr)
  or PMB 5212 - Fungi - A Kingdom of Their Own (3.0 cr)
- **Directed Research and Studies**

  Take 0 - 4 credit(s) from the following:

  - BIOC 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
  - BIOC 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)

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- BIOC 4993 - Directed Studies (1.0 - 7.0 cr)
- BIOC 4994 - Directed Research (1.0 - 7.0 cr)
- BIOL 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- BIOL 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- BIOL 4993 - Directed Studies (1.0 - 7.0 cr)
- BIOL 4994 - Directed Research (1.0 - 7.0 cr)
- COP 4793W - Writing Intensive Directed Studies [WI] (1.0 - 7.0 cr)
- COP 4794W - Writing Intensive Directed Research [WI] (1.0 - 7.0 cr)
- COP 4993 - Directed Studies (1.0 - 7.0 cr)
- COP 4994 - Directed Research (1.0 - 7.0 cr)
- EEB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- EEB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- EEB 4993 - Directed Studies (1.0 - 7.0 cr)
- EEB 4994 - Directed Research (1.0 - 6.0 cr)
- GCD 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- GCD 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- GCD 4993 - Directed Studies (1.0 - 7.0 cr)
- GCD 4994 - Directed Research (1.0 - 7.0 cr)
- MICB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- MICB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- MICB 4993 - Directed Studies (1.0 - 7.0 cr)
- MICB 4994 - Directed Research (1.0 - 7.0 cr)
- NSCI 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 6.0 cr)
- NSCI 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- NSCI 4993 - Directed Studies (1.0 - 7.0 cr)
- NSCI 4994 - Directed Research (1.0 - 6.0 cr)
- PMB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- PMB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- PMB 4993 - Directed Studies (1.0 - 7.0 cr)
- PMB 4994 - Directed Research (1.0 - 7.0 cr)

- PMB 3812 - Field Mycology (3.0 cr)
  or PMB 5812 - Field Mycology (3.0 cr)
- PMB 3802 - Field Microbiology at Itasca Biological Research Station (3.0 cr)
  or PMB 5802 - Field Microbiology at Itasca Biological Research Station (3.0 cr)

- **Other Elective Options**

Take 0 - 1 course(s) from the following:

- BIOC 4xxx
- BIOC 5xxx
- BIOL 3696 - Internship: Professional Experience in Biological Sciences (1.0 - 3.0 cr)
- BIOL 4xxx
- BIOL 5xxx
- CHEM 2311 - Organic Lab (4.0 cr)
- CSCI 1133 - Introduction to Computing and Programming Concepts (4.0 cr)
- EEB 4xxx
- EEB 5xxx
- GCD 4xxx
- GCD 5xxx
- MATH 1272 - Calculus II (4.0 cr)
- MICB 4xxx
- MICB 5xxx
- NSCI 4xxx
- NSCI 5xxx
- PMB 4xxx
- PMB 5xxx
- STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
- STAT 3021 - Introduction to Probability and Statistics (3.0 cr)
- EEB 4839 - Field Studies in Mammalogy (4.0 cr)
- Take 0 - 1 course(s) from the following:
  - GCC 3xxx
  - GCC 5xxx

Upper Division Writing Intensive within the Major

Students are required to take one upper division writing intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.

Take 0 - 1 course(s) from the following:

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- BIOC 4025W - Laboratory in Biochemistry [WI] (2.0 cr)
- BIOC 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- BIOC 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- BIOL 4321W - Deconstructing Research: Writing about Biological Research for Non-scientists [WI] (2.0 cr)
- BIOL 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- BIOL 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- COP 4793W - Writing Intensive Directed Studies [WI] (1.0 - 7.0 cr)
- COP 4794W - Writing Intensive Directed Research [WI] (1.0 - 7.0 cr)
- EEB 3408W - Ecology [WI] (4.0 cr)
- EEB 3412W - Introduction to Animal Behavior, Writing Intensive [WI] (4.0 cr)
- EEB 3811W - Animal Behavior in the Field [WI] (4.0 cr)
- EEB 4330W - Animal Communication [WI] (3.0 cr)
- EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
- EEB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- EEB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- GCD 4005W - Cell Biology-Writing Intensive [WI] (4.0 cr)
- GCD 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- GCD 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- MICB 4161W - Eukaryotic Microbiology [WI] (3.0 cr)
- MICB 4225W - Advanced Laboratory: Microbial Genetics [WI] (3.0 cr)
- MICB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- MICB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- NSCI 3001W - Neuroscience and Society [CIV, WI] (4.0 cr)
- NSCI 3102W - Neurobiology II: Perception and Behavior [WI] (3.0 cr)
- NSCI 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 6.0 cr)
- NSCI 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)
- PMB 3005W - Plant Function Laboratory [WI] (2.0 cr)
- PMB 3007W - Plant, Algal, and Fungal Diversity and Adaptation [WI] (4.0 cr)
- PMB 4516W - Plant Cell Biology: Writing Intensive [WI] (3.0 cr)
- PMB 4793W - Directed Studies: Writing Intensive [WI] (1.0 - 7.0 cr)
- PMB 4794W - Directed Research: Writing Intensive [WI] (3.0 - 5.0 cr)

Program Sub-plans

A sub-plan is not required for this program.

Integrated BS/MPH-Environmental Health

The College of Biological Sciences (CBS) and the School of Public Health (SPH) offer an early-admission opportunity for eligible CBS students interested in pursuing the Environmental Health MPH degree.

The MPH program in the Division of Environmental Health Sciences emphasizes the scientific, technological, policy, and management skills required to address environmental health concerns. These concerns include investigating health hazards in our environment, protecting worker health, and establishing the basis for public health policy. The Division of Environmental Health is committed to graduating professionals with interdisciplinary training, which includes practicing innovative problem solving, and gaining experience with a diversity of approaches and applications.

To be eligible for this program, applicants must be admitted undergraduate students in the College of Biological Sciences, have completed at least 60+ credits, and have a GPA of a least 3.25.

Students admitted to the Integrated BS/MPH-Environmental Health program take 12 MPH credits during their senior year, and complete the MPH by taking remaining credits as a full-time graduate student in the summer and academic year after completing their undergraduate degree.

Graduate courses cannot be applied toward both BS and MPH credit and degree requirements. Admitted students must maintain timely degree progress to ensure that the BS degree is awarded no later than the end of the senior year.

The application deadline for the Integrated BS/MPH-Environmental Health opportunity is the spring of the applicant's junior year. Interested students should consult with their CBS academic advisor or School of Public Health for application instructions.

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