Twin Cities Campus

Biology, Society, and Environment B.A.

Geography, Environment, Society

College of Liberal Arts

- Program Type: Baccalaureate
- Requirements for this program are current for Spring 2020
- Required credits to graduate with this degree: 120
- Required credits within the major: 66 to 84
- Degree: Bachelor of Arts

The biology, society, and environment program (BSE), housed in the Department of Geography, Environment, and Society, is a multidisciplinary biology program in the College of Liberal Arts (CLA). Majors in the program take courses in the biological, environmental, and social sciences and humanities throughout the University and frequently choose a focus on either human or environmental biology.

An extensive and rigorous curriculum reflects the breadth of subject matter and learning experiences vital to ensuring graduating students have maximum opportunities for employment in todays job market and are particularly well-prepared to successfully apply to various graduate and professional programs. Major requirements are quite flexible: students are encouraged to tailor elective course options around an intellectual goal or a topical theme; for example, students have combined a specialization in human biology with a thematic focus on health policy or bioethics. Others have combined plant ecology with a focus on global environmental solutions or history of science. Still others have studied evolutionary biology through an analytic lens focusing on science and culture. Many of our students also choose their coursework in preparation for the entrance exam to a health professional degree program and to complete any necessary prerequisite courses.

Students receive comprehensive training in biology, chemistry, math, and physics. They are also exposed to questions about the relevance of biology to social, environmental, and health-related problems from the various perspectives offered in the biosciences, social sciences, and humanities. The elective courses allow students to explore and deepen their understanding of biological and social systems, and their intersections.

Required and elective courses in the curriculum offer individual students the opportunity to study scientific practices and social and environmental problems. Just as importantly, students have the opportunity to:
Develop critical thinking skills and creative approaches to understanding such practices and problems using an array of conceptual and theoretical frameworks,
Consider the ethical issues inherent to both practices and problems and, of course, solutions,
Enhance their ability to communicate, particularly through writing,
Work as a team member to bridge disciplinary and institutional divisions.

Students are strongly encouraged to carry out independent research appropriate to the students intellectual, career, and professional development goals. The capstone, required of all CLA majors, offers a unique learning experience because it allows individuals to work with faculty members in their laboratories and in the field across the University of Minnesotas colleges and schools. Some students complete a formal Senior Thesis in the History of Medicine or select a wide variety of research topics, others complete professional grade posters, deliver oral presentations, or produce innovative original works that cross disciplinary divides.

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.

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

Students are required to take 4 semester(s) of any second language.

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CLA BA degrees require 18 upper division (3xxx-level or higher) credits outside the major designator. These credits must be taken in designators different from the major designator and cannot include courses that are cross-listed with the major designator. The major designator for the Biology, Society, and Environment BA is BSE.

The major curriculum includes courses in biology, chemistry, physics, and mathematics.

A given course may only count towards one major requirement.

At least 18 upper division credits in the major must be taken at the University of Minnesota - Twin Cities campus. This includes 9 credits of biosciences and 9 credits of science and society.

All incoming CLA freshmen must complete the First-Year Experience course sequence.

BSE Foundations

Take exactly 2 course(s) totaling 5 - 6 credit(s) from the following:

An Introduction to Biology, Society, and Environment

Take BSE 2001 within one semester of declaring the BSE major or prior to completing 90 credits.

Take exactly 1 course(s) totaling exactly 2 credit(s) from the following:

- BSE 2001 - An Introduction to Biology, Society, and Environment (2.0 cr)

- **Foundations in Science and Society**

Students may petition to substitute an additional Science & Society Elective course or a transfer course to fulfill this requirement.

Take exactly 1 course(s) totaling 3 - 4 credit(s) from the following:

- ANTH 1003W - Understanding Cultures [SOCS, GP, WI] (4.0 cr)
  or ANTH 1003V - Understanding Cultures: Honors [SOCS, GP, WI] (4.0 cr)
- GEOG 1301W - Our Globalizing World [SOCS, GP, WI] (3.0 cr)
- PHIL 1002W - Introduction to Philosophy [AH, WI] (4.0 cr)
  or PHIL 1026W - Philosophy and Cultural Diversity [AH, DSJ, WI] (3.0 cr)
- PHIL 1003W - Introduction to Ethics [CIV, WI] (4.0 cr)
- SOC 1001 - Introduction to Sociology [SOCS, DSJ] (4.0 cr)
  or SOC 1011V - Honors: Introduction to Sociology [SOCS, DSJ, WI] (4.0 cr)

Required Courses

Take 6 required courses for a total of 19-24 credits, by completing three Biosciences courses, two Science & Society courses, and one Science & Society Methods course.

Required Biosciences Courses

Take exactly 3 course(s) totaling 10 - 12 credit(s) from the following:

General Biology

Take exactly 1 course(s) totaling exactly 4 credit(s) from the following:

- BIOL 1009 - General Biology [BIOL] (4.0 cr)
  or BIOL 1009H - Honors: General Biology [BIOL] (4.0 cr)

- **Other Biosciences Courses**

The two courses must be from different areas, as divided below.

Take exactly 2 course(s) totaling 6 - 8 credit(s) including exactly 2 sub-requirements(s) from the following:

Cell Biology

- GCD 3033 - Principles of Cell Biology (3.0 cr)

- **Genetics**
  - BIOL 4003 - Genetics (3.0 cr)
    or GCD 3022 - Genetics (3.0 cr)

- **Ecology**

(BIOL 3807 at Itasca Experiment Station)

- EEB 3407 - Ecology (3.0 cr)
  or EEB 3408W - Ecology [WI] (4.0 cr)
  or EEB 3807 - Ecology (4.0 cr)

- **Evolution**
  - EEB 3409 - Evolution (3.0 cr)

Required Science & Society Courses

The two courses must be from different departments, as divided below.

Take exactly 2 course(s) totaling 6 - 8 credit(s) including exactly 2 sub-requirements(s) from the following:

Anthropology

- ANTH 3306W - Medical Anthropology [GP, WI] (3.0 cr)

- **Biology, Society, and Environment**
  - BSE 3361W *{Inactive}*[WI] (3.0 cr)
    or GEOG 3361W *{Inactive}*[WI] (3.0 cr)

- **Cultural Studies & Comparative Literature**

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•CSCL 3323 - Science and Culture [AH] (3.0 cr)
or CSCL 3322 - Visions of Nature: The Natural World and Political Thought [ENV] (3.0 cr)

•Geography
•GEOG 3411W - Geography of Health and Health Care [WI] (3.0 cr)
or GEOG 3379 - Environment and Development in the Third World [SOCS, ENV] (3.0 cr)
or GLOS 3303 *{Inactive}*[SOCS, ENV] (3.0 cr)

•Global Studies
•GLOS 3602 - Other Worlds: Globalization and Culture (3.0 cr)
or GLOS 3305 - Science for Sale: Environment, Capital, and Medicine (3.0 cr)
or GWSS 3205 *{Inactive}*(3.0 cr)

•Philosophy
Take PHIL 1005/1005H only prior to completing 90 credits and PHIL 4607 after completing 60 credits.
•PHIL 1005 - Scientific Reasoning (4.0 cr)
or PHIL 1005H *{Inactive}*(4.0 cr)
or PHIL 3600 *{Inactive}*(3.0 cr)
or PHIL 4607 - Philosophy of the Biological Sciences (3.0 cr)
or PHIL 3302W - Moral Problems of Contemporary Society [CIV, WI] (4.0 cr)
or PHIL 3322W - Moral Problems of Contemporary Society [CIV, WI] (3.0 cr)

•Sociology
•SOC 4246 - Sociology of Health and Illness (3.0 cr)
or SOC 4311 - Power, Justice & the Environment [DSJ] (3.0 cr)
or SOC 4305 - Environment & Society: An Enduring Conflict [ENV] (3.0 cr)
or GLOS 4305 *{Inactive}*[ENV] (3.0 cr)

Required Science & Society Methods Course
Take 1 Science & Society Methods course for 3-4 credits. Some courses are only available to students completing majors and minors in particular departments.
Take 1 or more course(s) totaling 3 - 4 credit(s) from the following:

Quantitative Methods
Take 0 or more course(s) from the following:
•SOC 3811 - Social Statistics [MATH] (4.0 cr)
•GEOG 3531 - Numerical Spatial Analysis (4.0 cr)
or GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
•STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
or STAT 3021 - Introduction to Probability and Statistics (3.0 cr)
•PSY 3801 - Introduction to Psychological Measurement and Data Analysis [MATH] (4.0 cr)
or PSY 3801H - Honors Introduction to Psychological Measurement and Data Analysis [MATH] (4.0 cr)

•Qualitative Methods
Take 0 or more course(s) from the following:
•ANTH 4035 - Ethnographic Research Methods (3.0 cr)
•SOC 3801 - Sociological Research Methods (4.0 cr)
•PSY 3001W - Introduction to Research Methods [WI] (4.0 cr)
or PSY 3001V - Honors Introduction to Research Methods [WI] (4.0 cr)

•Research Methods in History of Science & Medicine
Take 0 or more course(s) from the following:
•HSCI 3401 - Ethics in Science and Technology [HIS, CIV] (3.0 cr)
•HSCI 4455 - Women, Gender, and Science [HIS, DSJ] (3.0 cr)
•HMED 3002W - Health Care in History II [HIS, WI] (4.0 cr)
•HMED 3040 - Human Health, Disease, and the Environment in History [HIS] (3.0 cr)
•HMED 3065 - Body, Soul, and Spirit in Medieval and Renaissance European Medicine (3.0 cr)
•HMED 3075 - Technology and Medicine in Modern America [HIS, TS] (3.0 cr)
•HMED 3055 - Women, Health, and History [HIS, DSJ] (3.0 cr)
•HSCI 5244 - Nature's History: Science, Humans, and the Environment (3.0 cr)
or HSCI 3244 - Nature's History: Science, Humans, and the Environment [HIS, ENV] (3.0 cr)

Required Supporting Sciences Courses
Take 6 Required Supporting Sciences courses (with two labs) for a total of 22-23 credits.

Calculus
Take exactly 1 course(s) totaling exactly 4 credit(s) from the following:
•MATH 1142 - Short Calculus [MATH] (4.0 cr)
or MATH 1271 - Calculus I [MATH] (4.0 cr)
or MATH 1571H - Honors Calculus I [MATH] (4.0 cr)

Physics
Physics 1201W is preferred. PHYS 1001W does not meet this requirement.
Take exactly 1 course(s) totaling 4 - 5 credit(s) from the following:
•PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)

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or PHYS 1201W *{Inactive}*[PHYS, WI] (5.0 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)

Chemistry

No student may switch tracks after Chemistry II/Chemistry for Life Sciences II. Track 1 is the standard Chemistry sequence. Students completing CHEM 2301/H (Track 1) have the option to take CHEM 2302 and CHEM 2311 as BioSciences Electives. Students completing Track 2 will not have completed the prerequisites for CHEM 2301/H, and the Track II courses may not fulfill prerequisites for subsequent CHEM courses offered at UMN-TC.

Track I: Chemistry

Take exactly 5 course(s) totaling exactly 11 credit(s) from the following:

Chemistry I

•CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
or CHEM 1071H - Honors Chemistry I [PHYS] (3.0 cr)
•CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
or CHEM 1075H - Honors Chemistry I Laboratory [PHYS] (1.0 cr)

•Chemistry II

•CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
or CHEM 1072H - Honors Chemistry II [PHYS] (3.0 cr)
•CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
or CHEM 1076H - Honors Chemistry II Laboratory [PHYS] (1.0 cr)

•Organic Chemistry

•CHEM 2301 - Organic Chemistry I (3.0 cr)
or CHEM 2331H - Honors Elementary Organic Chemistry I (3.0 cr)

or **Track II: Chemistry for the Life Sciences**

Track II students can apply CHEM 2085 as one of their BioSciences non-lab Electives, choosing Track II will not result in more credits required for the BA.

Take exactly 6 course(s) totaling exactly 13 credit(s) from the following:

Chemistry for the Life Sciences I

•CHEM 1081 - Chemistry for the Life Sciences I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)

•Chemistry for the Life Sciences II

•CHEM 1082 - Chemistry for the Life Sciences II (3.0 cr)
CHEM 1086 - Chemistry for the Life Sciences II Laboratory (1.0 cr)

•Chemistry for the Life Sciences III

•CHEM 2081 - Chemistry for the Life Sciences III (3.0 cr)
CHEM 2085 - Chemistry for the Life Sciences III Laboratory (2.0 cr)

Biochemistry

BIOC 3021 meets 3 of the 9 credits required in upper-division UMN-TC biosciences courses.

Take exactly 1 course(s) totaling exactly 3 credit(s) from the following:

•BIOC 3021 - Biochemistry (3.0 cr)

Electives

Take 6 elective courses for a total of 18-27 credits, by completing 9-15 credits of Biosciences Electives and 9-12 credits of Science & Society Electives. Select coursework in consultation with BSE advisor and UMN-TC faculty. Students may wish to consult admissions staff of prospective post-graduate programs about their suggested prerequisites.

Biosciences Electives

Take 3 Biosciences Electives for a total of 9-15 credits. One of the three Bioscience Electives must be a laboratory course. Developing an area of specialization is strongly encouraged (e.g., human biology, plant biology & ecology, microbial genetics). Students are advised not to take more advanced courses without adequate grades in prerequisite courses. Up to one Learning Abroad course is allowed for Biosciences Elective credit; no HECUA credit allowed.

Upper division requirement

Two Biosciences Electives must be at the 3xxx-5xxx level. CHEM 2302, 2304 and 2311 and VBS 2032 do fulfill this requirement, but do not meet the UMNTC residency requirement (upper division UMNTC residency requirement).

Laboratory Course requirement

One Biosciences Elective must be a laboratory course, taken concurrently with a lecture course to qualify for major credit.
-CHEM 2311 and CHEM 2312H do not fulfill the Lab requirement
-1 and 2 cr labs do not count as an additional course (ANAT 3601 & 3602 = 1 course); 3 cr labs may count as a course
-ANTH 1001, BIOL 2012, PMB 2022, VBS 2032, or the 2nd course of a two semester sequence in general biology, with labs, taken at another college DOES fulfill the Lab requirement
-For reference, see list of Biosciences Electives Qualifying Laboratory Courses, with course titles, at the end of this catalog description

Biosciences Electives - Areas of Specialization

Take 3 or more course(s) totaling 9 - 15 credit(s) from the following:

Organic Chemistry

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

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•CHEM 2302 - Organic Chemistry II (3.0 cr)
•CHEM 2311 - Organic Lab (4.0 cr)
or CHEM 2312H - Honors Organic Lab (5.0 cr)

•Organismal Biology
Take 0 or more course(s) from the following:
•BIOL 2012 *{Inactive}*(4.0 cr)
•PMB 2022 - General Botany (3.0 cr)
•PMB 3007W - Plant, Algal, and Fungal Diversity and Adaptation [WI] (4.0 cr)
•BIOL 3270 *{Inactive}*(3.0 cr)
•FW 4101 - Herpetology (4.0 cr)
•FW 4136 - Ichthyology (4.0 cr)
•FW 4401 - Fish Physiology and Behavior (3.0 cr)
•PMB 4321 - Minnesota Flora (3.0 cr)
•PMB 4511 - Flowering Plant Diversity (3.0 cr)
•PMB 4516W - Plant Cell Biology: Writing Intensive [WI] (3.0 cr)
•PMB 3002 - Plant Biology: Function (2.0 cr)
PMB 3005W - Plant Function Laboratory [WI] (2.0 cr)

•Climate Change and Environmental Systems
Take 0 or more course(s) from the following:
•EEB 4611 - Biogeochemical Processes (3.0 cr)
•ESCI 3002 - Climate Change and Human History [ENV] (3.0 cr)
•GEOG 3401W - Geography of Environmental Systems and Global Change [ENV, WI] (3.0 cr)
•GEOG 3839 - Introduction to Dendrochronology (4.0 cr)
•GEOG 5426 - Climatic Variations (3.0 cr)

•Ecological Systems
Take 0 or more course(s) from the following:
•EEB 3603 - Science, Protection, and Management of Aquatic Environments (3.0 cr)
•EEB 4068 - Plant Physiological Ecology (3.0 cr)
•EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
•ENT 3925 *{Inactive}*(3.0 cr)
•ENT 4021 - Honey Bees and Insect Societies (3.0 cr)
•ENT 4251 - Forest and Shade Tree Entomology (3.0 cr)
•ESPM 3221 - Soil Conservation and Land-Use Management (3.0 cr)
•ESPM 3575 - Wetlands (3.0 cr)
•ESPM 3612W - Soil and Environmental Biology [WI] (4.0 cr)
•FNRM 3104 - Forest Ecology (4.0 cr)
•FNRM 3203 - Forest Fire and Disturbance Ecology (3.0 cr)
•FNRM 3411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
•FNRM 3501 - Arboriculture: Selection and Maintenance of Trees (3.0 cr)
•GEOG 3431 - Plant and Animal Geography (3.0 cr)
•SOIL 2125 - Basic Soil Science [PHYS, ENV] (4.0 cr)
•SOIL 3416 - Plant Nutrients in the Environment (3.0 cr)
•EEB 3851W - Health and Biodiversity [ENV, WI] (3.0 cr)
•EEB 3407 - Ecology (3.0 cr)
or EEB 3408W - Ecology [WI] (4.0 cr)
or EEB 3807 - Ecology (4.0 cr)
•BIOL 4590 - Coral Reef Ecology (2.0 cr)
BIOL 4596 *{Inactive}*(2.0 cr)

•Evolutionary Biology Options
Take 0 or more course(s) from the following:
•ANTH 1001 - Human Evolution [BIOL] (4.0 cr)
•EEB 4129 - Mammalogy (4.0 cr)
•ESCI 4102W - Vertebrate Paleontology: Evolutionary History and Fossil Records of Vertebrates [WI] (3.0 cr)
•ESCI 4103W - Fossil Record of Mammals [WI] (3.0 cr)
•ANTH 3002 - Sex, Evolution, and Behavior: Examining Human Evolutionary Biology (4.0 cr)
or EEB 3002 - Sex, Evolution, and Behavior: Examining Human Evolutionary Biology (4.0 cr)
•EEB 3409 - Evolution (3.0 cr)
•ANTH 4329 - Primate Ecology and Social Behavior (3.0 cr)
or EEB 4329 - Primate Ecology and Social Behavior (3.0 cr)

•Genetic, Cellular, & Developmental Biology
Take 0 or more course(s) from the following:
•GCD 3033 - Principles of Cell Biology (3.0 cr)
•GCD 3485 - Bioinformatic Analysis: Introduction to the Computational Characterization of Genes and Proteins (4.0 cr)
•GCD 4111 - Histology: Cell and Tissue Organization (4.0 cr)
•GCD 4134 *{Inactive}*(3.0 cr)
•GCD 4143 - Human Genetics and Genomics (3.0 cr)

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•GCD 4151 - Molecular Biology of Cancer (3.0 cr)
•GCD 4161 - Developmental Biology (3.0 cr)
•GCD 3022 - Genetics (3.0 cr)
or BIOL 4003 - Genetics (3.0 cr)

•Biology of Humans
Take 0 or more course(s) from the following:
•ANAT 3001 - Human Anatomy (3.0 cr)
•ANAT 3608H - Principles of Human Anatomy Laboratory for Honors Students (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 4101 - Development of the Nervous System: Cellular and Molecular Mechanisms (3.0 cr)
•NSCI 4105 - Neurobiology Laboratory I (3.0 cr)
•PHSL 3050 *{Inactive}*(3.0 cr)
•PHSL 3061 - Principles of Physiology (4.0 cr)
•ANTH 3405 - Human Skeletal Analysis (4.0 cr)
or ANTH 5405 - Human Skeletal Analysis (4.0 cr)

•Human Anatomy with Lab Options
(Take lab and lectures concurrently, to receive major credit)
Take 0 - 2 course(s) from the following:
•ANAT 3601 - Principles of Human Anatomy (3.0 cr)
or ANAT 3611 - Principles of Human Anatomy (3.0 cr)
•ANAT 3602 - Principles of Human Anatomy Laboratory (2.0 cr)
or ANAT 3608H - Principles of Human Anatomy Laboratory for Honors Students (3.0 cr)
or ANAT 3612 - Principles of Human Anatomy Laboratory (2.0 cr)

•Physiology of Humans and Other Animals with Lab Options
(Take lab and lectures concurrently, to receive major credit)
Take 0 - 2 course(s) from the following:
•PHSL 3051 - Human Physiology (4.0 cr)
•ANSC 3301 - Human and Animal Physiology (3.0 cr)
ANSC 3302 - Human and Animal Physiology Laboratory (1.0 cr)
•BIOL 3211 - Physiology of Humans and Other Animals (3.0 cr)
BIOL 2005 - Animal Diversity Laboratory (2.0 cr)
•BIOL 3211 - Physiology of Humans and Other Animals (3.0 cr)
BIOL 2007 - Marine Animal Diversity Laboratory (1.0 cr)

•Human and Animal Behavior
Take 0 or more course(s) from the following:
•EEB 4134 - Introduction to Ornithology (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)
•EEB 4329 - Primate Ecology and Social Behavior (3.0 cr)
or ANTH 4329 - Primate Ecology and Social Behavior (3.0 cr)

•Microbial Biology
Take 0 or more course(s) from the following:
•ESCI 4801 - Geomicrobiology (3.0 cr)
•PMB 4111 - Microbial Physiology and Diversity (3.0 cr)
•MICB 4161W - Eukaryotic Microbiology [WI] (3.0 cr)
•MICB 4171 - Biology, Genetics, and Pathogenesis of Viruses (3.0 cr)
•MICB 4215 - Advanced Laboratory: Microbial Physiology and Diversity (3.0 cr)
•MICB 4225W - Advanced Laboratory: Microbial Genetics [WI] (3.0 cr)
•MICB 4235 - Advanced Laboratory: Virology, Immunology, and Microbial Genetics (3.0 cr)
•MICB 3301 - Biology of Microorganisms (5.0 cr)
or VBS 2032 - General Microbiology With Laboratory (5.0 cr)
•PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
•MICB 4131 - Immunology (3.0 cr)
or VPM 4131 - Immunology (3.0 cr)

•Plant Breeding & Agronomy
Take 0 or more course(s) from the following:
•PLSC 3005W - Introduction to Plant Physiology [WI] (4.0 cr)
•HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (3.0 cr)

Biosciences Electives - Qualifying Laboratory Courses
At least one of the Biosciences Electives must be a laboratory course. The courses listed below qualify as laboratory courses for the Biosciences Elective requirement.
Take 0 - 2 course(s) from the following:
Courses with a Laboratory Component Included

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Take 0 - 1 course(s) from the following:
- ANAT 3608H - Principles of Human Anatomy Laboratory for Honors Students (3.0 cr)
- ANTH 1001 - Human Evolution [BIOL] (4.0 cr)
- BIOL 2012 *{Inactive}*(4.0 cr)
- PMB 2022 - General Botany (3.0 cr)
- PMB 3007W - Plant, Algal, and Fungal Diversity and Adaptation [WI] (4.0 cr)
- EEB 4068 - Plant Physiological Ecology (3.0 cr)
- EEB 4129 - Mammalogy (4.0 cr)
- EEB 4134 - Introduction to Ornithology (4.0 cr)
- ENT 4251 - Forest and Shade Tree Entomology (3.0 cr)
- FW 4101 - Herpetology (4.0 cr)
- FW 4136 - Ichthyology (4.0 cr)
- GEOG 3839 - Introduction to Dendrochronology (4.0 cr)
- MICB 3301 - Biology of Microorganisms (5.0 cr)
- MICB 4215 - Advanced Laboratory: Microbial Physiology and Diversity (3.0 cr)
- MICB 4225W - Advanced Laboratory: Microbial Genetics [WI] (3.0 cr)
- NSCI 4105 - Neurobiology Laboratory I (3.0 cr)
- PMB 4511 - Flowering Plant Diversity (3.0 cr)
- PHSL 3051 - Human Physiology (4.0 cr)
- VBS 2032 - General Microbiology With Laboratory (5.0 cr)
- EEB 3407 - Ecology (3.0 cr)
  or EEB 3408W - Ecology [WI] (4.0 cr)
  or EEB 3807 - Ecology (4.0 cr)
- EEB 3409 - Evolution (3.0 cr)

•Courses Requiring Concurrent Registration with a Laboratory Course

Take 0 - 2 course(s) from the following:
Students taking ANAT 3601 or 3611 must concurrently register for ANAT 3602, 3608H, or 3612
- ANAT 3601 - Principles of Human Anatomy (3.0 cr)
  or ANAT 3611 - Principles of Human Anatomy (3.0 cr)
  with ANAT 3602 - Principles of Human Anatomy Laboratory (2.0 cr)
  or ANAT 3608H - Principles of Human Anatomy Laboratory for Honors Students (3.0 cr)
  or ANAT 3612 - Principles of Human Anatomy Laboratory (2.0 cr)
- ANSC 3301 - Human and Animal Physiology (3.0 cr)
  with ANSC 3302 - Human and Animal Physiology Laboratory (1.0 cr)
- BIOL 3211 - Physiology of Humans and Other Animals (3.0 cr)
  with BIOL 2005 - Animal Diversity Laboratory (2.0 cr)
  or BIOL 2007 - Marine Animal Diversity Laboratory (1.0 cr)
- PMB 3002 - Plant Biology: Function (2.0 cr)
  with PMB 3005W - Plant Function Laboratory [WI] (2.0 cr)

Science & Society Electives

Take 3 Science & Society Electives for a total of 9-12 credits. Exploring a theme is suggested. Some examples include: ethics in health care; health policy; global environmental solutions; science and social change; science & culture: public understanding of science.

Take exactly 3 course(s) totaling 9 - 12 credit(s) from the following:

Anthropology

Take no more than 2 course(s) from the following:
- ANTH 3306W - Medical Anthropology [GP, WI] (3.0 cr)
- ANTH 3035 - Anthropologies of Death [SOCS, GP] (3.0 cr)
- ANTH 3036 - The Body in Society (3.0 cr)
- ANTH 4075 - Cultural Histories of Healing [SOCS, GP] (3.0 cr)
- ANTH 5031W *{Inactive}*[WI] (3.0 cr)

•Cultural Studies

Take no more than 2 course(s) from the following:
- CSCL 3323 - Science and Culture [AH] (3.0 cr)
- CSCL 3322 - Visions of Nature: The Natural World and Political Thought [ENV] (3.0 cr)
- CSCL 3351W - The Body and the Politics of Representation [HIS, WI] (3.0 cr)

•Environmental Policy and Sustainability

Take no more than 2 course(s) from the following:
- ESPM 3011W - Ethics in Natural Resources [CIV, WI] (3.0 cr)
- ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
- ESPM 3245 - Sustainable Land Use Planning and Policy [ENV] (3.0 cr)
- HORT 4850 *{Inactive}*(3.0 cr)
- SUST 3003 - Sustainable People, Sustainable Planet [ENV] (3.0 cr)

•Geography of Health and Environments

Take no more than 2 course(s) from the following:

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•GEOG 3376 - Political Ecology [ENV] (3.0 cr)
•GEOG 3411W - Geography of Health and Health Care [WI] (3.0 cr)
•GEOG 3388 - Going Places: Geographies of Travel and Tourism [CIV] (3.0 cr)
•GEOG 3379 - Environment and Development in the Third World [SOCS, ENV] (3.0 cr)
or GLOS 3303 *{Inactive}*[SOCS, ENV] (3.0 cr)
•GEOG 3381W - Population in an Interacting World [SOCS, GP, WI] (3.0 cr)
or GLOS 3701W *{Inactive}*[SOCS, GP, WI] (3.0 cr)

•Health & Environmental Policy
Take no more than 3 course(s) from the following:
•BSE 3361W *{Inactive}*[WI] (3.0 cr)
or GEOG 3361W *{Inactive}*[WI] (3.0 cr)
•AAS 4231 - Color of Public Policy: African Americans, American Indians, Asian Americans & Chicanos in the U.S. (3.0 cr)
or AFRO 4231 - Color of Public Policy: African Americans, American Indians, Asian Americans & Chicanos in the U.S. (3.0 cr)
or AMIN 4231 - Color of Public Policy: African Americans, American Indians, Asian Americans, & Chicanos in the U.S. (3.0 cr)
or CHIC 4231 - Color of Public Policy: African Americans, American Indians, Asian Americans & Chicanos in the U.S. (3.0 cr)

•Health & Environment in the City
Take no more than 1 course(s) from the following:
•URBS 3751 - Understanding the Urban Environment [ENV] (3.0 cr)

•Interdisciplinary Gender & Inequality Studies
Take no more than 2 course(s) from the following:
•GWSS 3203W - Blood, Bodies and Science [TS, SOCS, WI] (3.0 cr)
•GWSS 3215 - Bodies That Matter: Feminist Approaches to Disability Studies [DSJ] (3.0 cr)
•GWSS 3415 - Feminist Perspectives on Domestic Violence and Sexual Assault [DSJ] (3.0 cr)
•GWSS 3002W - Gender, Race, and Class in the U.S. [DSJ, WI] (3.0 cr)
or GWSS 3002V - Honors: Gender, Race and Class in the U.S. [DSJ, WI] (3.0 cr)

•Interdisciplinary Global Studies
Take no more than 2 course(s) from the following:
•GLOS 3602 - Other Worlds: Globalization and Culture (3.0 cr)
•GLOS 3305 - Science for Sale: Environment, Capital, and Medicine (3.0 cr)
or GWSS 3205 *{Inactive}*(3.0 cr)
•GLOS 3415W - Global Institutions of Power: World Bank, International Monetary Fund, and World Trade Organization [GP, WI] (3.0 cr)
or SOC 3417W - Global Institutions of Power: World Bank, International Monetary Fund, and World Trade Organization [GP, WI] (3.0 cr)

•History of Medicine and Science
Take no more than 2 course(s) from the following:
•HMED 3001W - Health, Disease, and Healing I [HIS, WI] (4.0 cr)
•HMED 3002W - Health Care in History II [HIS, WI] (4.0 cr)
•HMED 3040 - Human Health, Disease, and the Environment in History [HIS] (3.0 cr)
•HMED 3055 - Women, Health, and History [HIS, DSJ] (3.0 cr)
•HMED 3065 - Body, Soul, and Spirit in Medieval and Renaissance European Medicine (3.0 cr)
•HMED 3075 - Technology and Medicine in Modern America [HIS, TS] (3.0 cr)
•HSCI 2333V - Honors Course: A Century of Science in Modern America [HIS, CIV, WI] (3.0 cr)
•HSCI 3211 - Biology and Culture in the 19th and 20th Centuries [HIS, CIV] (3.0 cr)
•HSCI 3242 - Navigating a Darwinian World [HIS] (3.0 cr)
•HSCI 3244 - Nature's History: Science, Humans, and the Environment [HIS, ENV] (3.0 cr)
•HSCI 3331 - Technology and American Culture [HIS, TS] (3.0 cr)
•HSCI 3332 - Science in the Shaping of America [HIS, DSJ] (3.0 cr)
•HSCI 3401 - Ethics in Science and Technology [HIS, CIV] (3.0 cr)
•HSCI 3815 - Making Modern Science: Atoms, Genes and Quanta [HIS, GP] (3.0 - 4.0 cr)
•HSCI 4455 - Women, Gender, and Science [HIS, DSJ] (3.0 cr)

•Medical & Environmental Ethics
Take no more than 2 course(s) from the following:
•BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
•BTHX 5325 - Biomedical Ethics (3.0 cr)
•PHIL 3005W - General History of Western Philosophy: Modern Period [AH, WI] (4.0 cr)
•PHIL 3301 - Environmental Ethics [ENV] (4.0 cr)
•PHIL 3304 - Law and Morality (3.0 cr)
•PHIL 3305 - Medical Ethics (4.0 cr)
•PHIL 3302W - Moral Problems of Contemporary Society [CIV, WI] (4.0 cr)
or PHIL 3322W - Moral Problems of Contemporary Society [CIV, WI] (3.0 cr)

•Philosophy of Science
Take no more than 2 course(s) from the following:
•PHIL 3601W - Scientific Thought [WI] (4.0 cr)
•PHIL 3600 *{Inactive}*(3.0 cr)
•PHIL 3607 - Philosophy of Psychology (4.0 cr)

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•PHIL 4607 - Philosophy of the Biological Sciences (3.0 cr)

•Psychology

NURS 2001 is equivalent to taking NURS 3690 and 3691.
Take no more than 2 course(s) from the following:
•PSY 3061 - Introduction to Biological Psychology (3.0 cr)
•PSY 3604 - Introduction to Psychopathology (3.0 cr)
•PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
•PSY 3135 - Introduction to Individual Differences (3.0 cr)
or PSY 5135 - Psychology of Individual Differences (3.0 cr)
•NURS 2001 - Human Growth and Development: A Life Span Approach (3.0 cr)
or NURS 3690 *{Inactive}*(2.0 cr)
NURS 3691 *{Inactive}*(1.0 cr)

•Public Health

Take no more than 2 course(s) from the following:
•PUBH 3102 - Issues in Environmental and Occupational Health (3.0 cr)

•Science, Health & Environmental Communication

Take no more than 2 course(s) from the following:
•ENGL 3501 - Public Discourse: Coming to Terms with the Environment [LITR, ENV] (3.0 cr)
•JOUR 5541 - Mass Communication and Public Health (3.0 cr)
•SPAN 3404 - Medical Spanish and Community Health Learning (3.0 cr)
•WRIT 3152W - Writing on Issues of Science and Technology [WI] (3.0 cr)
•WRIT 3315 - Writing on Issues of Land and the Environment [AH, DSJ] (3.0 cr)
•WRIT 4431W - Science, Technology, and the Law [CIV, WI] (3.0 cr)

•Sociology

Take no more than 2 course(s) from the following:
•SOC 4246 - Sociology of Health and Illness (3.0 cr)
•AAS 3251W - Sociological Perspectives on Race, Class, and Gender [SOCS, DSJ, WI] (3.0 cr)
or AFRO 3251W - Sociological Perspectives on Race, Class, and Gender [WI] (3.0 cr)
or SOC 3251W - Sociological Perspectives on Race, Class, and Gender [SOCS, DSJ, WI] (3.0 cr)
•GLOS 3613W - Stuffed and Starved: The Politics of Eating [SOCS, GP, WI] (3.0 cr)
or GLOS 3613V *{Inactive}*[SOCS, GP, WI] (3.0 cr)
or SOC 3613W - Stuffed and Starved: The Politics of Eating [SOCS, GP, WI] (3.0 cr)
or SOC 3613V *{Inactive}*[SOCS, GP, WI] (3.0 cr)
•SOC 4305 - Environment & Society: An Enduring Conflict [ENV] (3.0 cr)
or GLOS 4305 *{Inactive}*[ENV] (3.0 cr)
•SOC 4311 - Power, Justice & the Environment [DSJ] (3.0 cr)
or GLOS 4311 - Power, Justice & the Environment [DSJ] (3.0 cr)

•Theory and Practice

Take no more than 2 course(s) from the following:
•HECU 3571W *{Inactive}*[WI] (4.0 cr)
•HECU 3572 *{Inactive}*(4.0 cr)
•HECU 3591 *{Inactive}*(4.0 cr)
•HECU 3592 *{Inactive}*(4.0 cr)
•ID 3595W *{Inactive}*[CIV, WI] (4.0 cr)
•ID 3596 *{Inactive}*(4.0 cr)

Senior Project

Take 1-2 courses for a total of 2-4 credits. Students are responsible for identifying a senior project supervisor and should begin planning during their Junior Year. All students attend a planning workshop and submit a senior project proposal that must be approved by the BSE office prior to beginning work. All forms should be submitted by published deadlines. A written component is required and students must register A-F.

Option 1: Directed Research with a UMNTC Faculty Supervisor

Take 1 or more course(s) totaling 3 or more credit(s) from the following:

a) BSE Project Registration

Students supervised by GES (BSE, GEOG, GIS, URBS) & AHS faculty (Medical School, Dental School and others) register for a minimum of 3 credits in:
•BSE 3996 *{Inactive}*(3.0 - 4.0 cr)
or BSE 3996H *{Inactive}*(3.0 - 4.0 cr)

•b) Science & Society Project

Students supervised by ANTH, BTHX, CSCL, GLOS, GWSS, HSCI, PHIL, POL, PUBH or SOC faculty register for a minimum of 3 credits in:
•ANTH 4993 - Directed Study (1.0 - 6.0 cr)
or ANTH 4994W - Directed Research [WI] (1.0 - 6.0 cr)
or BTHX 5900 - Independent Study in Bioethics (1.0 - 4.0 cr)
or CSCL 4993 - Directed Study (1.0 - 3.0 cr)
or GLOS 5994 - Directed Research (1.0 - 4.0 cr)

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or GWSS 4994 - Directed Research (1.0 - 8.0 cr)
or HSCI 5993 - Directed Studies (1.0 - 15.0 cr)
or HSCI 5994 - Directed Research (1.0 - 15.0 cr)
or PHIL 3993 - Directed Studies (1.0 - 3.0 cr)
or POL 4994 - Directed Research: Individual (1.0 - 4.0 cr)
or PSY 4993 - Directed Research: Special Areas of Psychology and Related Sciences (1.0 - 6.0 cr)
or PUBH 3093 - Directed Study: Public Health (1.0 - 4.0 cr)
or PUBH 3893 - Directed Study: Health Services Research and Policy (1.0 - 4.0 cr)
or SOC 4093 - Directed Study (1.0 - 4.0 cr)

•**c) Biosciences Project**

Students supervised by faculty members appointed in College of Biological Sciences or other UMNTC colleges register for a minumum of 3 credits in a directed studies/research course. Follow procedures of that college.

or **Option 2: Senior Project Seminar**

Contact instructor prior to registration of these courses; seats are limited.
Take 1 or more course(s) totaling 2 - 4 credit(s) from the following:
•HMED 4965W - Senior Research in Medical History (3.0 cr)
•URBS 3955W - Senior Paper Seminar [WI] (2.0 cr)

or **Option 3: Supplemental Research Project**

Senior Project is supervised by an instructor teaching a Science & Society Required or Elective course in a CLA Department. Obtain permission from instructor and BSE advisor prior to first day of class. Concurrently register for an eligible Science & Society course and 2 credits in one of the following courses (A-F only):
Take 1 or more course(s) totaling 2 or more credit(s) from the following:
•BSE 3997 *{Inactive}*(2.0 cr)
•ANTH 4993 - Directed Study (1.0 - 6.0 cr)
•CSCL 4993 - Directed Study (1.0 - 3.0 cr)
•GLOS 5994 - Directed Research (1.0 - 4.0 cr)
•GWSS 4994 - Directed Research (1.0 - 8.0 cr)
•PHIL 3993 - Directed Studies (1.0 - 3.0 cr)
•PSY 4993 - Directed Research: Special Areas of Psychology and Related Sciences (1.0 - 6.0 cr)
•SOC 4093 - Directed Study (1.0 - 4.0 cr)

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. BSE majors are also encouraged to take at least one additional writing intensive course in an area related to biosciences. Honors students must complete a course from this list.
Take 0 - 1 course(s) from the following:
•ANTH 3306W - Medical Anthropology [GP, WI] (3.0 cr)
•ANTH 4994W - Directed Research [WI] (1.0 - 6.0 cr)
•ANTH 5031W *{Inactive}*[WI] (3.0 cr)
•PMB 3005W - Plant Function Laboratory [WI] (2.0 cr)
•PMB 3007W - Plant, Algal, and Fungal Diversity and Adaptation [WI] (4.0 cr)
•CSCL 3351W - The Body and the Politics of Representation [HIS, WI] (3.0 cr)
•EEB 3408W - Ecology [WI] (4.0 cr)
•EEB 3412W - Introduction to Animal Behavior, Writing Intensive [WI] (4.0 cr)
•EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
•ESCI 4102W - Vertebrate Paleontology: Evolutionary History and Fossil Records of Vertebrates [WI] (3.0 cr)
•ESCI 4103W - Fossil Record of Mammals [WI] (3.0 cr)
•ESPM 3011W - Ethics in Natural Resources [CIV, WI] (3.0 cr)
•ESPM 3241W - Natural Resource and Environmental Policy [SOCS, CIV, WI] (3.0 cr)
•ESPM 3612W - Soil and Environmental Biology [WI] (4.0 cr)
•GEOG 3411W - Geography of Health and Health Care [WI] (3.0 cr)
•GWSS 3203W - Blood, Bodies and Science [TS, SOCS, WI] (3.0 cr)
•HMED 3001W - Health, Disease, and Healing I [HIS, WI] (4.0 cr)
•HMED 3002W - Health Care in History II [HIS, WI] (4.0 cr)
•HMED 4965W - Senior Research in Medical History (3.0 cr)
•HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (3.0 cr)
•MICB 4161W - Eukaryotic Microbiology [WI] (3.0 cr)
•MICB 4225W - Advanced Laboratory: Microbial Genetics [WI] (3.0 cr)
•NSCI 3102W - Neurobiology II: Perception and Behavior [WI] (3.0 cr)
•PHIL 3005W - General History of Western Philosophy: Modern Period [AH, WI] (4.0 cr)
•PHIL 3601W - Scientific Thought [WI] (4.0 cr)
•PLSC 3005W - Introduction to Plant Physiology [WI] (4.0 cr)
•PMB 4516W - Plant Cell Biology: Writing Intensive [WI] (3.0 cr)
•EEB 3851W - Health and Biodiversity [ENV, WI] (3.0 cr)
•WRIT 3152W - Writing on Issues of Science and Technology [WI] (3.0 cr)

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•WRIT 4431W - Science, Technology, and the Law [CIV, WI] (3.0 cr)
•AAS 3251W - Sociological Perspectives on Race, Class, and Gender [SOCS, DSJ, WI] (3.0 cr)
or AFRO 3251W - Sociological Perspectives on Race, Class, and Gender [WI] (3.0 cr)
or SOC 3251W - Sociological Perspectives on Race, Class, and Gender [SOCS, DSJ, WI] (3.0 cr)
•BSE 3361W *{Inactive}*[WI] (3.0 cr)
or GEOG 3361W *{Inactive}*[WI] (3.0 cr)
•GEOG 3381W - Population in an Interacting World [SOCS, GP, WI] (3.0 cr)
or GLOS 3701W *{Inactive}*[SOCS, GP, WI] (3.0 cr)
•GLOS 3613W - Stuffed and Starved: The Politics of Eating [SOCS, GP, WI] (3.0 cr)
or GLOS 3613V *{Inactive}*[SOCS, GP, WI] (3.0 cr)
or SOC 3613W - Stuffed and Starved: The Politics of Eating [SOCS, GP, WI] (3.0 cr)
or SOC 3613V *{Inactive}*[SOCS, GP, WI] (3.0 cr)
•GWSS 3002W - Gender, Race, and Class in the U.S. [DSJ, WI] (3.0 cr)
or GWSS 3002V - Honors: Gender, Race and Class in the U.S. [DSJ, WI] (3.0 cr)
•PHIL 3302W - Moral Problems of Contemporary Society [CIV, WI] (4.0 cr)
or PHIL 3322W - Moral Problems of Contemporary Society [CIV, WI] (3.0 cr)

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