Duluth Campus

Environmental Science B.S.

D Earth & Environmental Sci

Swenson College of Science and Engineering

- Program Type: Baccalaureate
- Requirements for this program are current for Spring 2019
- Required credits to graduate with this degree: 120
- Required credits within the major: 99 to 103
- Degree: Bachelor of Science

The BS in environmental science is designed for students who want a multidisciplinary science education focusing on aspects of the environment. This environmental science program requires a broad base of knowledge in the basic sciences and mathematics, physics, chemistry, biology, Earth sciences, and statistics. In addition, prudent study of environmental science requires understanding of economic, political, and ethical considerations. Environmental science features an intense grounding in resource issues (including courses in renewable and non-renewable resources) and builds on the strength of UMD in freshwater issues. In addition, the capstone course deals with sources, distribution, and ultimate fate of air, water, and solid waste pollution. Elective courses from areas such as habitats, climate processes, environmental chemistry, quantitative methods, and global resources are also required.

The program is predicated on the belief that a student graduating with a BS in environmental science should have a firm background in physical and life sciences and a basic understanding of 1) existing environmental policies and regulations and the legislative process of their formation; 2) the major environmental issues including water, global climate, energy, pollution, and population; 3) techniques of environmental monitoring and prediction; and 4) economics and business organization.

Program Delivery

This program is available:

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

Admission Requirements

For entering freshmen, the only admission requirement is acceptance into the College of Science and Engineering. Transfer students must meet campus and college requirements and are accepted into the program at the level corresponding to credits completed, based on existing transfer manuals and on faculty judgment when courses are not in existing manuals.

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

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

Required Environmental Science Core (16 cr)

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CHE 4613 - Air Pollution Control (3.0 cr)
EES 2210 *{Inactive}*(4.0 cr)
EES 3201 - Environmental Resources and Remediation (3.0 cr)
EES 3202 - Energy Resources (3.0 cr)
EES 4102 - Environmental Assessment (3.0 cr)

Required Courses From Other Programs (65 - 66 cr)

Biology
BIOL 1011 - General Biology I [LE CAT, NAT SCI] (5.0 cr)
BIOL 1012 - General Biology II [SUSTAIN] (5.0 cr)
BIOL 2801 - General Ecology (3.0 cr)
BIOL 2802 - Ecology Laboratory (2.0 cr)

Chemistry I and lab
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)

Chemistry II and lab
CHEM 1155 - General Chemistry II (4.0 cr)
CHEM 1156 - General Chemistry Lab II (1.0 cr)

Analytical Chemistry
CHEM 2212 - Environmental Chemistry [NAT SCI, SUSTAIN] (4.0 cr)
or CHEM 2222 - Quantitative Analysis (3.0 cr)
CHEM 2223 - Quantitative Analysis Laboratory (1.0 cr)

Economics
ECON 1022 - Principles of Economics: Macro [LE CAT, SOC SCI] (3.0 cr)
or ECON 1023 - Principles of Economics: Micro [LE CAT, SOC SCI] (3.0 cr)

Geology
EES 1110 - Geology and Earth Systems [LE CAT, NAT SCI, SUSTAIN] (4.0 cr)
EES 3100 *{Inactive}*(3.0 cr)
or GEOG 3401 - Weather and Climate (3.0 cr)

Mathematics
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)
MATH 1297 - Calculus II [LOGIC & QR] (5.0 cr)

Physics I course
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
PHYS 2014 - General Physics Lab I [NAT SCI] (1.0 cr)

Physics II course
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)

Statistics
STAT 2411 - Statistical Methods [LE CAT, LOGIC & QR] (3.0 cr)
or STAT 3411 - Engineering Statistics (3.0 cr)
or STAT 3611 - Introduction to Probability and Statistics (4.0 cr)

Advanced Writing
WRIT 3150 - Advanced Writing: Science (3.0 cr)

Water Science Electives (8-11 cr)

Must include three courses, at least one course each from Group A and B. Courses used to satisfy a water science elective may not be used to satisfy a concentration elective. At least one course used to fill the water science electives or the concentration electives must have a laboratory or field component.
Take 3 or more course(s) totaling 8 - 11 credit(s) from the following:

Group A Groundwater
Take 1 - 2 course(s) from the following:
- GEOL 5240 *{Inactive}*(4.0 cr)
- EES 5250 - Hydrogeology (4.0 cr)
- EES 4710 - Geochemistry (4.0 cr)
- EES 5251 - Well Hydraulics (3.0 cr)

Group B Surface Water
Take 1 - 2 course(s) from the following:
- BIOL 3760 - Marine Biology (3.0 cr)
- BIOL 3761 - Field Studies in Marine Biology (4.0 cr)
- BIOL 3830 *{Inactive}*(3.0 cr)

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- BIOL 3835 - Freshwater Ecology (3.0 cr)
- BIOL 4839 - Coral Reef Field Studies [GLOBAL PER] (3.0 cr)
- BIOL 5777 *{Inactive}*(2.0 cr)
- BIOL 5805 - Fisheries Ecology and Management (3.0 cr)
- BIOL 5833 - Stream Ecology (3.0 cr)
- BIOL 5861 - Lake Ecology (3.0 cr)
- BIOL 5870 - Wetland Ecology (3.0 cr)
- GEOG 4446 - Water Processes and Management (3.0 cr)
- EES 4201 - Watershed Hydrology (3.0 cr)
- LIM 5004 *{Inactive}*(2.0 cr)
- LIM 5101 - Physical Limnology (3.0 cr)
- LIM 5102 - Chemical Limnology (3.0 cr)
- LIM 5103 - Geological Paleolimnology (3.0 cr)

Concentration Electives (10 cr)

Courses can be distributed among the groups in any combination. Discuss with advisor the benefits of breadth (credits in several concentrations) versus depth (credits in a particular concentration).

Take 10 or more credit(s) from the following:

Climate Processes

Take 0 - 10 credit(s) from the following:

- GEOG 3422 - Natural Hazards (3.0 cr)
- GEOG 4446 - Water Processes and Management (3.0 cr)
- EES 3210 *{Inactive}*(4.0 cr)
- EES 5210 - Glacial and Quaternary Geology (4.0 cr)
- EES 5220 *{Inactive}*(3.0 cr)
- LIM 5103 - Geological Paleolimnology (3.0 cr)
- EES 3100 *{Inactive}*(3.0 cr)

  or GEOG 3401 - Weather and Climate (3.0 cr)

•Environmental Chemistry

Take 0 - 10 credit(s) from the following:

- 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)
- GEOL 3710 *{Inactive}*(3.0 cr)
- EES 4710 - Geochemistry (4.0 cr)
- LIM 5102 - Chemical Limnology (3.0 cr)

•Global Resources

Take 0 - 10 credit(s) from the following:

- ECON 3721 - Natural Resource and Energy Economics (3.0 cr)
- ECON 3777 - Environmental Economics (3.0 cr)
- GEOG 3461 - Geography of Global Resources (3.0 cr)
- GEOG 4451 - The Geography of Soils (4.0 cr)
- GEOL 3800 *{Inactive}*(4.0 cr)
- GEOL 5240 *{Inactive}*(4.0 cr)
- EES 5250 - Hydrogeology (4.0 cr)
- EES 4355 - Economic Geology (4.0 cr)

•Habitats

Take 0 - 10 credit(s) from the following:

- BIOL 3760 - Marine Biology (3.0 cr)
- BIOL 3761 - Field Studies in Marine Biology (4.0 cr)
- BIOL 3830 *{Inactive}*(3.0 cr)
- BIOL 4839 - Coral Reef Field Studies [GLOBAL PER] (3.0 cr)
- BIOL 5777 *{Inactive}*(2.0 cr)
- BIOL 5801 - Microbial Ecology (2.0 cr)
- BIOL 5802 *{Inactive}*(2.0 cr)
- BIOL 5805 - Fisheries Ecology and Management (3.0 cr)
- BIOL 5808 *{Inactive}*(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)
- EES 4201 - Watershed Hydrology (3.0 cr)

•Quantitative Methods

Take 0 - 10 credit(s) from the following:

- BIOL 5807 - Mathematical Ecology (3.0 cr)

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- CHE 2111 - Material and Energy Balances (3.0 cr)
- CHE 2121 - Chemical Engineering Thermodynamics (3.0 cr)
- CHE 3111 - Fluid Mechanics (3.0 cr)
- CHE 5022 *{Inactive}*(3.0 cr)
- GIS 3563 - Geographic Information Science I: Theory and Analysis (4.0 cr)
- GIS 3564 - Geographic Information Science II: Applied GIS (4.0 cr)
- GIS 5572 - Environmental Application of GIS (4.0 cr)
- GIS 5581 - Digital Image Processing and Analysis (4.0 cr)
- LIM 5004 *{Inactive}*(2.0 cr)
- LIM 5101 - Physical Limnology (3.0 cr)
- MATH 3280 - Differential Equations with Linear Algebra (4.0 cr)
- PHYS 5053 - Data Analysis Methods in Physics (3.0 cr)
- PHYS 5541 - Fluid Dynamics (3.0 cr)
- STAT 5411 - Analysis of Variance (3.0 cr)

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