

Environmental Sciences Major

Weinberg College of Arts and Sciences

Northwestern University

This brochure is designed as a resource for students contemplating a major in Environmental Sciences and as a guide to program requirements for current majors. For more information, please visit our website at envsci.northwestern.edu or email environment@northwestern.edu.

Program of Study

Between twenty and twenty-two courses are required to complete an Environmental Sciences major, depending on a student's placement in science and mathematics courses upon entering Northwestern. The major is structured around four successive levels of coursework.

- I. **Foundation** courses in science, mathematics, and social science support an understanding of environmental issues. *(Ten or eleven courses required)*
- II. **Core** courses represent the first step toward focusing on the environment. These are specialized courses drawing from the earth and biological sciences and engineering. *(Three courses required)*
- III. **Advanced Studies** courses are upper-level courses in science, social science, and engineering that develop the theory and methods of environmental analysis. At this stage, students typically choose a Science or Policy Track. *(Six courses required)*
- IV. **Environmental Research** is the capstone of the program. It is a two-quarter research seminar taken in the senior year. *(Two courses required)*

It is advisable to complete the Foundation courses in the first two years and to take the Core courses during the second and third years.



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Required and Elective Course Options in Environmental Sciences:

I. Foundation Courses

Students should make every effort to complete their foundation courses in the first two years of study at Northwestern.

All of these are required:

- a. MATH 220 (Differential Calculus of One-Variable Functions), 224 (Integral Calculus of One-Variable Functions) OR 212, 213, and 214 (Single-Variable Calculus I, II, III).
- b. CHEM 101 (General Chemistry), 102 (General Inorganic Chemistry), and 103 (General Physical Chemistry) OR 171 (Accelerated General Inorganic Chemistry) and 172 (Accelerated General Physical Chemistry).

Plus five of the following:

- a. BIOL_SCI 210-1 (Genetics and Evolutionary Biology), Biological Sciences 164 (Genetics and Evolution).
- b. CHEM 210-1,2 (Organic Chemistry 1).
- c. ECON 201 (Introduction to Macroeconomics), 202 (Introduction to Microeconomics). Counts as two courses.
- d. MATH 230 (Differential Calculus of Multivariable Functions), MATH 250 (Elementary Differential Equations).
- e. PHYSICS 135-1,2,3 (General Physics).
- f. STAT 210 (Introductory Statistics for the Social Sciences).

At least two of the five courses should come from the same category (i.e. BIOL_SCI, CHEM, ECON, PHYSICS, or STAT/MATH). Nine or ten courses are required.

II. Core Courses

Three courses are required.

- a. ENVR_SCI 201 (Earth, A Habitable Planet), 202 (The Health of the Biosphere), 203 (Energy and the Environment: The Automobile).

III. Advanced Studies Courses

*Six courses are required, of which four must be at the 300 level. Students may select which advanced courses to take based on whether or not they wish to follow the **Science Track** or the **Policy Track**. Otherwise, they should choose four from the science list and two from the society list.*

Science Track:

Four courses from the science list; two from the society list.

Policy Track:

ECON 281, 310-1, 370; plus three additional courses, two of which must be from the science list.

a. Science Courses:

- i. ANTHRO 306 (Evolution of Life Histories), 312 (Human Population Biology).
- ii. BIOL_SCI 313 (Quantitative Methods for Ecology and Conservation), 316 (Spring Flora), 330 (Plant Biology), 332 (Conservation Genetics), 335 (Fundamentals of Plant Biology and Conservation), 341 (Population Genetics), 346 (Field Ecology), 347 (Conservation Biology), 349 (Plant Community Ecology), 350 (Plant Evolution and Diversity Laboratory).
- iii. CHEM 306 (Environmental Chemistry), 329 (Analytical Chemistry), 342-1 (Thermodynamics), 393 (Green Chemistry).
- iv. CIV_ENV 260 (Fundamentals of Environmental Engineering), 340 (Fluid Mechanics II), 358 (Airphoto Interpretation), 361-1 (Environmental Microbiology), 361-2 (Public and Environmental Health), 363 (Environmental Engineering Applications I: Air and Land), 364 (Environmental Engineering Applications II: Water), 365 (Environmental Laboratory) 367 (Aquatic Chemistry).
- v. EARTH 201 (Earth Systems Revealed), 301 (Petrology: Evolution of Crustal and Mantle Rocks), 310 (Introductory Aqueous Geochemistry), 312 (Stable Isotope Geochemistry), 313 (Radiogenic Isotope Geochemistry), 314 (Organic Geochemistry), 316 (Earth's Changing Climate), 317 (Biogeochemistry, cross-listed as CIV_ENV 447), 326 (Data Analysis for Earth and Planetary Sciences), 330 (Sedimentary Geology), 331 (Field Problems in Sedimentary Geology), 360 (Instrumentation and Field Methods).
- vi. GEOG 211 (World Biogeography), 341 (Principles of Cartography), 343 (Geographic Information Systems).
- vii. ISEN 210 (Intro to Energy Systems for the 21st Century)
- viii. MECH_ENG 241 (Fluid Mechanics I).

b. Environment and Society Courses:

- i. ANTHRO 310 (Evolution and Culture), 383 (Environmental Anthropology).
- ii. CIV_ENV 303 (Environmental Law and Policy), 349 (Environmental Management), 360 (Environmental Impact Evaluation), 368

- (Sustainability: Issues and Action, Near and Far), 395 (Special Topics in Civil Engineering).
- iii. ECON 270 (Introduction to Environmental Economics), 370 (Environmental and Natural Resource Economics).
- iv. ENVR_POL 390 (Special Topics in Environmental Policy and Culture), 394 (Professional Linkage Seminar), 398 (Environmental Research Seminar).
- v. GEOG 328 (Human Use of the Earth).
- vi. HIST 215 (Western Hemisphere Environments From 1492-Present).
- vii. ISEN 230 (Climate Change and Sustainability: Political and Ethical Dimensions)
- viii. PHIL 268 (Ethics and the Environment).
- ix. POLI_SCI 349 (International Environmental Politics), 367 (Politics and Nature in Comparative Perspective). Cross-listed with Environmental Policy and Culture.
- x. RELIGION 261 (American Religion, Ecology, and Culture).
- xi. SOCIOLOG 311 (Food, Politics, and Society), 312 (Social Basis of Environmental Change).

Additional courses fulfilling the Environment and Society courses requirements are offered in various departments each year under special topics headings or as linkage seminars. Consult Prof Neal Blair, the Environmental Sciences program director for details.

IV. Environmental Research

One of the following sequences is required.

- a. ENVR_SCI 398-1,2 (Environmental Research), CIV_ENV 398-1,2 (Community-Based Design), OR two quarters of EARTH 399 (Independent Study).

Environmental Sciences Courses

The 200-level courses listed here carry distribution-requirement credits in Area I (Natural Sciences), and they are open to all students at Northwestern. Entrance to the 300-level courses is based on permission from the instructor.

ENVR_SCI 201 Earth, A Habitable Planet The Earth as a system of interconnected components: the atmosphere, hydrosphere, geosphere and biosphere; the coevolution of Earth and life. Prerequisite: CHEM 103 or equivalent.

ENVR_SCI 202 The Health of the Biosphere Population processes in nature; role of human population growth; interactions between populations; major impacts of human populations on the environment. Prerequisite: CHEM 103 or equivalent.

ENVR_SCI 203 Energy and the Environment: The Automobile The complex relationship between humans and the natural environment as we simultaneously attempt to maintain valuable functions while modifying the environment to meet ever increasing societal needs. Examples of topics include land use, energy production and their cumulative impacts on the environment. Prerequisite: CHEM 103 or equivalent.

ENVR_SCI 390 Internship in Environmental Sciences Participation in off-campus research activities of public and private environmental organizations under the supervision of faculty. Prerequisite: junior or senior standing and consent of program director.

ENVR_SCI 398-1,2 Environmental Research Independent research directed by environmental sciences faculty. Research design and scientific communication. Prerequisite: senior standing and major in environmental sciences.

Majors, Honors, and Advising

Entering freshmen who plan to pursue an Environmental Sciences major are advised to complete the 100-level chemistry and 200-level calculus requirements during their first year at Northwestern. Completion of these requirements as well as those in foreign language and the Freshmen Seminars will allow the students to make normal progress through the Environmental Sciences major during the remaining three years of their time at Northwestern.

All students are required to complete Env. Sci. 398-1,2, Civ. Eng. 398-1,2, or two quarters of EARTH 339 as part of the major's research requirement. Students who have strong grade point averages in the major and in their general university coursework may be eligible for program honors at graduation. A committee of Environmental Sciences faculty reviews each student's record of academic performance and reads each student paper completed in the senior research seminar. Those with strong academic records and who also have demonstrated excellence in their seminar papers are nominated for honors. Final determination of honors status is made by a committee of faculty in the Weinberg College of Arts and Sciences.