ENVIRONMENTAL SCIENCES (BS)

All environmental sciences first majors take the following courses in science:

Code	Title	Hours
Science Courses		
BIOS 10171 & BIOS 11173	Biology I :Big Questions and Biological Investigations Laboratory	4
BIOS 10172 & BIOS 11174	Biology II: Molecules to Ecosystems and Research Experience in Biology Laboratory	4
CHEM 10171 & CHEM 11171	Introduction to Chemical Principles and Introduction to Chemical Principles Laboratory	4
CHEM 10172 & CHEM 11172	Organic Structure and Reactivity and Organic Structure and Reactivity Laboratory	4
MATH 10350 & MATH 10360	Calculus A and Calculus B [1, 2, 3]	8
SC 20110 & SC 21110	Planet Earth and Planet Earth Laboratory	4
PHYS 20210 & PHYS 21210	Physics for Life Sciences I and Physics for Life Sciences I Lab	4
PHYS 20220 & PHYS 21220	Physics for Life Sciences II and Physics for Life Sciences II Lab	4
BIOS 40411	Biostatistics [4]	4
BIOS 30312 & BIOS 31312	General Ecology and Practical Ecology Laboratory	5
Chemistry Elective [5]		3-4
BIOS 40491	Current Topics in Environmental Science	3
Science Electives (chosen from an approved list, completing a required minimum total of 69 credits in science) [6]		18
BIOS 30305	Evolution	
BIOS 30310	The History of Life	
BIOS 20250 or BIOS 20300	Classical and Molecular Genetics Fundamentals of Genetics	
BIOS 30318	Introduction to Biocomputing	
BIOS 30401	Principles of Microbiology	
BIOS 30407	Animal Behavior	
BIOS 30420	Aquatic Ecology	
BIOS 40527	Stream Ecology	
Numerous other BIOS courses as designated by the ES director, including 60000-level graduate courses are accepted		
CHEM 20204	Environmental Chemistry	
CHEM 20274	Chemistry across the Periodic Table	
CHEM 40420	Principles of Biochemistry	
MATH 20550	Calculus III	
MATH 20580	Introduction to Linear Algebra and Differential Equations	
SC 40300	Geochemistry	
SC 30500	Geomorphology for Engineers and Scientists	

1 Equivalent or higher-level sequences in mathematics may be substituted, e.g., Honors Mathematics I (MATH 10850)–Honors Mathematics II (MATH 10860) for Calculus A (MATH 10350)–Calculus B (MATH 10360).

2 Students interested in the area of ecological modeling are strongly urged to take Calculus I (MATH 10550)–Calculus II (MATH 10560) for their mathematics requirement. Other mathematics courses should be taken as science electives.

3 Students who have completed only six hours of mathematics in their first year may transfer into the program, but they will be required to complete a mathematics sequence equivalent to MATH 10350–MATH 10360 or MATH 10550–MATH 10560. Students having taken Elements of Calculus (MATH 10250), (or MATH 10260 or MATH 10270) may do this by taking Calculus B (MATH 10360), while those who have taken only one semester of lower-level calculus should take both Calculus A (MATH 10350), Calculus B (MATH 10360). (See also the discussion on science degree credit found later in this section.)

4 Students transferring into the major, or transfer students who have previously taken a statistics course equivalent to Statistics for Life Sciences (ACMS 20340), **may be** allowed to have this course count for Biostatistics (BIOS 40411) with the permission of the ES Director. Students will be allowed to substitute Statistics for Life Sciences (ACMS 20340), or an equivalent statistics course (e.g., Statistics for Behavioral Sciences (PSY 30100)) in exceptional cases with the permission of the director of their major and the associate dean of the College of Science.

5 The 4-credit chemistry elective requirement is satisfied by either one additional course in organic chemistry (CHEM 20273) or Inorganic Chemistry (CHEM 20274) or by Analytical Chemistry (CHEM 30333, CHEM 31333) or by an alternative 4-credit CHEM course as approved by the director of their major and by the associate dean of the College of Science. Students are also allowed to take the 3-credit CHEM 10122 lecture or CHEM 20204 with the understanding that if/when a laboratory is established for that course, they will be required to take that lab prior to graduation.

6 Select CE courses may be allowed with the approval of the associate dean, College of Science.
Other SC courses as approved by the ES director may be included as they become available. Select courses offered in Study Abroad (UC-Dublin, UWA-Perth) also may be counted toward the ES science electives as well as select CE courses not cross-listed with SC, with permission of the ES director.
Students interested in attending graduate school in environmental sciences should consider taking science electives beyond requirements of this major. For example, for admission into some graduate programs, a year of organic chemistry would be a requirement. Deviations from the approved list of science electives must be approved by the advisor for the major.

Non-science Courses

Also required are the following non-science courses:

Code	Title	Hours
Non-Science Courses		
One philosophy or theology University requirement must be in the area of ethics. An ethics course with emphasis on environmental biology or life science issues, i.e., Environmental Ethics or Science, Technology, and Society, or other approved arts and letters courses.		
ECON 10010 or ECON 20010	Principles of Microeconomics [1, 2] Principles of Microeconomics	

Students are also urged to choose their electives from a recommended list of arts and letters courses [3]

1 The economics requirement for this major is fulfilled by taking Principles of Microeconomics either in the first year (ECON 10010) or in the second through fourth years (ECON 20010). Note, the course Social Science University Seminar (ECON 13181) will not fulfill the economics requirement for this major

2 For this major, the University social science requirement will be fulfilled by the required microeconomics course.

3 Numerous STV courses are recommended as electives as approved by the ES director. The STV courses may be taken either under the STV label or from the primary departmental cross-list

Sample Curriculum (B.S. Degree Majors):

Course	Title	Hours
First Year		
First Semester		
Biology I lecture and lab [1]		4
Calculus I (or A)		4
General Chemistry I lecture and lab		4
Theology or Philosophy		3
Writing Requirement		3
Moreau First Year Experience		1
	Hours	**19**
Second Semester		
Biology II lecture and lab		4
Calculus II (or B)		4
Organic Chemistry I lecture and lab		4
Theology or Philosophy		3
Writing Requirement		3
	Hours	**18**
Sophomore Year		
First Semester		
Planet Earth lecture and lab		4
General Ecology lecture		3
Practical Ecology lab		2
Language I		4
Microeconomics		3
	Hours	**16**
Second Semester		
CHEM Elective lecture [2]		3
Biostatistics		4
Language II		3
Theology or Philosophy		3
	Hours	**13**
Junior Year		
First Semester		
Physics I lecture and lab		4
Theology or Philosophy		3
Language III		3
Ways of Knowing IV		3
SCI Elective I		3
	Hours	**16**
Second Semester		
Physics II lecture and lab		4
SCI Elective II		3
SCI Elective III		3
Ways of Knowing V		3
	Hours	**13**
Senior Year		
First Semester		
Current Topics		3
SCI Elective IV		3
SCI Elective V		3
Ways of Knowing VI		3
Free Elective [3]		3
	Hours	**15**
Second Semester		
SCI Elective VI		3
Free Elective [3]		4
Free Elective [3]		3
Free Elective [3]		3
Moreau Senior Capstone		1
	Hours	**14**
	Total Hours	**124**

1 Ideally, students who decide to major in environmental sciences before beginning their first year should take Biology I :Big Questions (BIOS 10171)–Biology II: Molecules to Ecosystems (BIOS 10172). This will allow for an additional year of relevant science and other electives to be included in their total curriculum.

2 The 4-credit chemistry elective requirement is satisfied by either one additional course in organic chemistry (CHEM 20273) or Inorganic Chemistry (CHEM 20274) or by Analytical Chemistry (CHEM 30333/CHEM 31333) or by an alternative 4-credit CHEM course as approved by the director of their major and by the associate dean of the College of Science. Students are also allowed to take the 3-credit CHEM 10122 lecture or CHEM 20204 with the understanding that if/when a laboratory is established for that course, they will be required to take that lab prior to graduation.

3 As is the case for science first majors, six credits of the science course work in this program may also be counted toward the student's university science requirement.

Summary of Requirements for Graduation for Environmental Sciences Major

Code	Title	Hours
Biological Sciences		16
Chemistry		12
Geology		4
Mathematics		8
Physics		8
Current Topics		3
Science Electives		18
Total Science		69
Language Intermediate-Level Competency		3
University Requirement		3
Philosophy [1]		6
Theology [1]		6
University Requirement		3
University Requirement		3
University Requirement		3
Free Electives [2]		26
Moreau First Year Experience [3]		2
Total Hours		**124**

1 One of these courses must be a University Seminar 13180–13189
2 Assumes intermediate-level competency in language was achieved by taking a minimum of one three-credit course
3 Students will take a 1-credit Moreau First-Year Seminar course during their first year and complete their 1-credit Moreau experience in their final year

Honors

ES majors can participate in the Biological Sciences departmental honors program. See page 150 for more information.

Environmental Sciences Major with a Concentration in Earth Science

The following outlines the course requirements (totaling 34 credits) for Earth Sciences concentration:

Code	Title	Hours
CE 20520	Environmental Mineralogy	4
CE 20320	Environmental Aquatic Chemistry	3
CE 20300	Global Change, Water and Energy	3
CE 30530	Sedimentology and Stratigraphy	3
CE 30300	Introduction to Environmental Engineering	3
CE 30540	Petrology/Earth Materials	3
CE 30560	Dynamic Earth and Natural Disasters	3
CE 40300	Geochemistry	3
CE 40350	Environmental Microbiology	3
CE 40381	Environmental Isotope Geochemistry	3
CE 45200	Geology Field Trip	1
CE 45340	Fall Geology Field Trip	1
CE 47600	Special Studies (Earth Sciences Reading Course)	0-10

Sample Curriculum with a Concentration in Earth Sciences

Course	Title	Hours
First Year		
First Semester		
Biology I lecture and lab		4
Calculus I (or A)		4
General Chemistry I lecture and lab		4
Theology or Philosophy		3
Writing Requirement		3
Moreau First Year Experience		1
	Hours	**19**
Second Semester		
Biology II lecture and lab		4
Calculus II (or B)		4
Organic Chemistry I lecture and lab		4
Theology or Philosophy		3
Writing Requirement		3
	Hours	**18**
Sophomore Year		
First Semester		
Planet Earth lecture and lab		4
General Ecology lecture		3
Practical Ecology lab		2
Language I		4
Microeconomics		3
	Hours	**16**
Second Semester		
Global Change, Water and Energy		3
Environmental Aquatic Chemistry		3
CHEM Elective lecture and lab [1]		4
Language II		3
Theology or Philosophy		3
	Hours	**16**
Junior Year		
First Semester		
Environmental Mineralogy		3
Geomorphology		3
Physics I lecture and lab		4
Theology or Philosophy		3
Fall Field Trip		1
Language III		3
	Hours	**17**
Second Semester		
Petrology of Earth Materials and Lab		4
Sedimentation and Stratigraphy		3
Physics II lecture and lab		4
Spring Field Trip		1
Ways of Knowing IV		3
	Hours	**15**
Senior Year		
First Semester		
Environmental Isotope Geochemistry		3
Geochemistry		3
Current Topics		3
Ways of Knowing V		3
Ways of Knowing VI		3
	Hours	**15**
Second Semester		
Dynamic Earth		3
Biostatistics		4
Environmental Microbiology		3
Free Elective [2]		3
Free Elective [2]		3
Moreau Senior Capstone		1
	Hours	**17**
	Total Hours	**133**

1 The 4-credit chemistry elective requirement is satisfied by either one additional course in organic chemistry (CHEM 20273) or Inorganic Chemistry (CHEM 20274) or by Analytical Chemistry (CHEM 30333/CHEM 31333) or by an alternative 4-credit CHEM course as approved by the director of their major and by the associate dean of the College of Science. Students are also allowed to take the 3-credit CHEM 10122 lecture or CHEM 20204 with the understanding that if/when a laboratory is established for that course, they will be required to take that lab prior to graduation.
2 As is the case for science first majors, six credits of the science course work in this program may also be counted toward the student's university science requirement.