Department of Earth and Environmental Sciences

(College of Humanities, Arts and Sciences)

www.earth.uni.edu

The Department of Earth and Environmental Sciences offers the following programs:

Undergraduate Major (B.S.)

- Environmental Science (p. 1) (also listed in Department of Biology)

Undergraduate Majors (B.A.)

- Earth Science (p. 3)
- Earth Science-Teaching (p. 3)
- Environmental Resource Management (p. 4) (also listed in Department of Geography, Department of Biology, and Department of Health, Recreation and Community Services)
- Environmental Science (p. 8)

Minors

- Air Quality (p. 9)
- Astronomy (p. 9)
- Earth Science (p. 9)
- Earth Science-Teaching (p. 9)
- Environmental Assessment (p. 9)
- Environmental Data Analysis (p. 10)
- Environmental Earth Science (p. 11)
- Geology (p. 11)
- Hydrology (p. 11)

The Department of Earth and Environmental Sciences encompasses five curricular disciplines: astronomy, meteorology, geology, earth science education and environmental science.

Major programs are offered in two baccalaureate areas:

- Bachelor of Sciences
- Bachelor of Arts

The B.A. degree in Earth Science is designed as a broad liberal arts major that can build a strong foundation for a variety of career plans. It also provides supportive background and additional career options as a second major for students majoring in other disciplines such as mathematics, computer science, technology, anthropology, geography, biology, chemistry or related areas. The B.A. degree in Earth Science-Teaching is designed to prepare secondary Earth Science teachers. The B.A. degree in Environmental Science will provide students with the tools necessary to assess and evaluate environmental issues in various fields including air quality, hydrology and geoscience.

Bachelor of Sciences Degree Programs

Environmental Science Major

The Environmental Science major requires a minimum of 120 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

The B.S. Environmental Science program will include two curricular paths for students, one with a life science emphasis and the other with an earth science emphasis. The program will enable students to prepare for a graduate program in the environmental sciences or to directly enter industry in the public or private sector. All students will have a common core of courses providing a foundation in biology and geosciences, and will also be required to take part in a capstone research project.*

For students pursuing the B.S. Environmental Science major, the Department of Biology will waive BIOL 2052 as a prerequisite for BIOL 3000-level courses.

For students pursuing the B.S. Environmental Science major, the Department of Biology will waive BIOL 3140 as a prerequisite for BIOL 4000-level courses.

A student with a major in the interdisciplinary B.S. Environmental Science: Environmental Life Science Track may not also declare a major or minor in biology.

Required Core		
BIOL 2051	General Biology: Organismal Diversity	4
BIOL 3100	Evolution, Ecology and the Nature of Science	3
Chemistry and Biochemistry		5-8
CHEM 1110 & CHEM 1120	General Chemistry I and General Chemistry II	
or CHEM 1130	General Chemistry I-II	
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 1300	Introduction to Geology	4
GEOG 2410	Geographic Information Systems I	3
MATH 1420	Calculus I	4
BIOL 3190	Undergraduate Research in Biology	3
or EARTHSCI 4400	Undergraduate Research in Earth and Environmental Science	
Choose one of the following tracks outlined below:		**33**
Environmental Life Sciences Track		

Environmental Earth Science Track

Total Hours	**62-65**

Environmental Life Sciences Track

Required:		
BIOL 4157/5157	Biostatistics	3
BIOL 4168/5168	Ecology	4
Electives:		26
Pick courses from each of the three categories (A, B, & C) to accumulate to a minimum of 26 hours.		
Category A - Content Policy Related Courses (select a minimum of 2 courses)		
BIOL 4105/5105	Wildlife Ecology and Management	
BIOL 4108/5108	Biodiversity Conservation Policy	
BIOL 4167/5167	Conservation Biology	
BIOL 4180/5180	Restoration Ecology	
Category B - Content Biology Related Courses (select a minimum of 2 courses)		
BIOL 3109/5109	Plants of North America	
BIOL 3120	Plant Diversity and Evolution	
BIOL 3151	General Microbiology	
BIOL 3170	Entomology	
BIOL 4164/5164	Mammalogy	
Category C - Cognates (select a minimum of 2 courses)		
CHEM 2040	Applied Organic and Biochemistry	
or CHEM 2210	Organic Chemistry I	
EARTHSCI 1320	Earth History	
EARTHSCI 3210/5210	Meteorology	
EARTHSCI 3230/523	Air Quality	
EARTHSCI 3325/532	Sedimentary Geology	
EARTHSCI 3330/533	Geomorphology	
EARTHSCI 3340/534	Oceanography	
EARTHSCI 3345/534	Environmental Geology	
EARTHSCI 3350/535	Environmental Hydrology	
EARTHSCI 3355/535	Hydrogeology	
EARTHSCI 3360/536	Field and Laboratory Methods in Hydrology	
GEOG 2210	Modern Climate Change: Evidence and Predictions	
GEOG 3220	Environmental Geography: Variable Topic **	
GEOG 4370/5370	Remote Sensing of the Environment	
GEOG 4320/5320	Geographic Information Systems II	
GEOG 4220/5220	Soils and Landscapes	
GEOG 4230/5230	Rivers	
GEOG 4240/5240	The Ice Age **	
MATH 1421	Calculus II	
Total Hours		**33**

Environmental Earth Science Track

Required:		
EARTHSCI 3230/5230	Air Quality	4
EARTHSCI 3345/5345	Environmental Geology	3
EARTHSCI 3350/5350	Environmental Hydrology	3
Electives:		23
Pick courses from each of the Categories (A & B) to accumulate a minimum of 23 hours		
Category A - Physical Environment Relate Courses (select a minimum of 4 courses)		
EARTHSCI 1320	Earth History	
EARTHSCI 1400	Introduction to Environmental Earth Science	
EARTHSCI 3210/5210	Meteorology	
EARTHSCI 3240/524	Air Quality Modeling	
EARTHSCI 3250/525	Measurement and Analysis of Air Quality	
EARTHSCI 3322	Earth Materials	
EARTHSCI 3325/532	Sedimentary Geology	
EARTHSCI 3327/532	Paleoclimatology	
EARTHSCI 3330/533	Geomorphology	
EARTHSCI 3340/534	Oceanography	
EARTHSCI 3355/535	Hydrogeology	
EARTHSCI 3360/536	Field and Laboratory Methods in Hydrology	
Category B - Cognates (select a minimum of 2 courses)		
BIOL 3109/5109	Plants of North America	
BIOL 3120	Plant Diversity and Evolution	
BIOL 3170	Entomology	
BIOL 4105/5105	Wildlife Ecology and Management	
BIOL 4108/5108	Biodiversity Conservation Policy	
BIOL 4157/5157	Biostatistics	
BIOL 4164/5164	Mammalogy	
BIOL 4167/5167	Conservation Biology	
BIOL 4168/5168	Ecology	
BIOL 4180/5180	Restoration Ecology	
CHEM 2040	Applied Organic and Biochemistry	
or CHEM 2210	Organic Chemistry I	
GEOG 2210	Modern Climate Change: Evidence and Predictions	
GEOG 3220	Environmental Geography: Variable Topic **	
GEOG 4220/5220	Soils and Landscapes	
GEOG 4320/5320	Geographic Information Systems II	
GEOG 4230/5230	Rivers	
GEOG 4240/5240	The Ice Age **	
GEOG 4370/5370	Remote Sensing of the Environment	

MATH 1421	Calculus II	
Total Hours		**33**

* Students must receive a grade of C- (1.67) or higher in courses that are applied to their major. Prior to enrollment in a course, all prerequisites must be completed with a C- (1.67) or higher.

** These courses have additional prerequisites as follows:
GEOG 3220 has a prerequisite of GEOG 1120 or GEOG 1210 or GEOG 2210 or GEOG 1110 or consent of instructor.
GEOG 4240/5240 has prerequisite of GEOG 1210; GEOG 2210; EARTHSCI 1300.

Bachelor of Arts Degree Programs

Earth Science Major

The Earth Science major requires a minimum of 120 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

Required

Earth Science:		
EARTHSCI 1100	Astronomy	3
EARTHSCI 1110	Astronomy Laboratory	1
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 1300	Introduction to Geology	4
EARTHSCI 1320	Earth History	4
Experiential Learning Requirement (2 hours from the following):		2
EARTHSCI 3410/5410	Field Studies in _____	
EARTHSCI 3430	Internship	
EARTHSCI 4400	Undergraduate Research in Earth and Environmental Science	
Or an experience approved by the department		
Mathematics:		4
MATH 1140	Precalculus	
or MATH 1420	Calculus I	
Electives in Earth Science (3000/4000 EARTHSCI courses must include at least one course from each of astronomy, geology, and meteorology)		16
Cognates - choose one of the following two options:		**5 or 8**
Option 1 Chemistry (5 hours)		
CHEM 1130	General Chemistry I-II	
OR		
Option 2 Chemistry/Physics (8 hours)		
CHEM 1110	General Chemistry I	
and one of the following:		
CHEM 1120	General Chemistry II	
PHYSICS 1511	General Physics I	
PHYSICS 1701	Physics I for Science and Engineering	
Option 1 total hours 42		
Option 2 total hours 45		
Total Hours		**42-45**

Earth Science Major-Teaching

The Earth Science-Teaching major requires a minimum of 120 total hours to graduate. This total includes UNIFI/General Education requirements, the Professional Experiences requirements, Educator Essentials requirements, and the following specified major requirements, to complete the minimum of 120 hours.

This major leads to endorsement #153: 5-12 Earth Science.

Required

Chemistry and Biochemistry:		
CHEM 1110	General Chemistry I	4
Earth Science:		
EARTHSCI 1100	Astronomy	3
EARTHSCI 1110	Astronomy Laboratory	1
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 1210	Elements of Weather Laboratory	1
EARTHSCI 1300	Introduction to Geology	4
EARTHSCI 1320	Earth History	4
EARTHSCI 3120/5120	Planets	3
EARTHSCI 3210/5210	Meteorology	4
Physics:		
PHYSICS 1511	General Physics I	4
Electives in earth science: 3000/4000-level courses *		**11**
Total Hours		**42**

* Excluding the following Courses: EARTHSCI 3186/4186/5186 "Studies in", EARTHSCI 3420/5420, EARTHSCI 3430, EARTHSCI 4198 "Independent Study".

Professional Experiences

Required:

EDUC 2385	Teaching Methods l: Secondary Science *, **	3
EDUC 2485	Teaching Internship l: Secondary Science	3
EDUC 3585/5585	Teaching Methods ll: Secondary Science *	3
EDUC 3685/5685	Teaching Internship ll: Secondary Science	3
EDUC 4138	Secondary School Teaching	12
Total Hours		**24**

* A grade of C (2.00) or higher is required for all Methods courses.

** Earth Science Teaching majors can count EDUC 2385 Teaching Methods l: Secondary Science for category 5 of Educator Essentials.

Educator Essentials

Required: *

Select one of the following in each category:		
Category 1: The Learner		**3**
EDPSYCH 1500	Reflections on Learning	
EDPSYCH 2068	Development and Learning in Sociocultural Contexts	

EDPSYCH 2100	Creativity and Higher Order Thinking in the Classroom	
SOCFOUND 2243	Rethinking the Learning Society: Education and Its Future(s)	
Category 2: Social Contexts of Learning		**3**
SOCFOUND 2119	Social & Cultural Foundations of Education	
SOCFOUND 2134	A Modern History of Education in the United States	
SOCFOUND 2334	Education Policy and Politics of Education	
TESOL 2015	Language Today	
Category 3: Education for All		**3**
KINES 4152	Adapted Physical Education	
SOCFOUND 3334	Education, Power, and Change	
SOCFOUND 3434	Social Movements and Education	
SPIE 3140	Interdisciplinary and Intersectional Study of Education for All	
SPIE 3150	Meeting the Needs of Diverse Learners in Classrooms	
TESOL 3710	Content Area Strategies for English Language Learners	
Category 4: The Classroom Environment		**3**
EDPSYCH 3200	Deeper Motivation and the Highly Engaged Classroom	
EDPSYCH 3300	Level Up: Gamified Learning Environments	
ELEMECML 4151	Early Childhood Curriculum Development and Organization	
RTNL 3360	Playful Learning and Project-Based Experiences: Techniques for Ed and Recreational Environments	
SOCFOUND 3219	Critical Perspectives on Technology and Education	
Category 5: Effective Pedagogy		**3**
ARTED 4600	Expressive Learning Assessment	
LRNTECH 3600	Technology, Pedagogy, and Learning in the Digital Age	
MEASRES 3510	Assessment for Learning	
TEACHING 3500	Effective Teaching through Differentiation, Technology and Assessment	
Category 6: The Professional Educator		**3**
ELEMECML 3149	Child, Family, School and Community Relationships	
SOCFOUND 3519	Teacher Leadership & Educational Change	
TEACHING 3177	Collaborative Partnerships for Educators	
Total Hours		**18**

* A grade of C (2.00) or higher is required in each Educator Essentials course.

Environmental Resource Management Major

The Environmental Resource Management major requires a minimum of 120 total hours to graduate. This total includes UNIFI/ General Education requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

The Environmental Resource Management major is aimed at students searching for career options in the broadly-defined 'outdoor environment' that are related to natural resources, environmental systems, and sustainable development. This program will prepare students for careers in the environmental and human management of public and private spaces across differing categories of environmental systems - from public parks and lands to conservancy units managed by governmental and other non-profit agencies and organizations. This program aims to serve those students who do not wish to pursue careers as environmental scientists *per se* from more tightly focused 'environmental science' programs.

- *STUDENTS ARE REQUIRED TO TAKE THE CORE REQUIREMENTS (31 HOURS) AND MAY CHOOSE ONLY ONE OF THE FOUR SPECIALIZATION TRACKS (30-32 HOURS).*
- *Each track is composed of clusters of courses with a specific concentration, each of which has a separate hourly requirement.*
- *For purposes of this degree program, those prerequisite courses required by BIOL, EARTHSCI, GEOG, and RTNL for mid/upper-level courses in each Track THAT ARE NOT INCLUDED IN THE CORE REQUIREMENTS will normally be waived by the appropriate departments.*
- *The separate tracks allow students to specialize in the area of most general interest while the primary & secondary foci within each track make sure students also are exposed to a wide range of important auxiliary coursework.*
- *A student with a major in the interdisciplinary B.A. Environmental Resource Management: Ecosystems Track may not declare another major or minor in biology.*
- *By permission of the Provost's Office, students enrolled in the B.A. Environmental Resource Management major will be considered majors in all four of the participating departments.*

Core Requirements

BIOL 2051	General Biology: Organismal Diversity	4
BIOL 3100	Evolution, Ecology and the Nature of Science *	3
CHEM 1110	General Chemistry I	4
EARTHSCI 1300	Introduction to Geology	4
or		
GEOG 1210 & GEOG 1211	Planet Earth and Planet Earth Laboratory	
EARTHSCI 3330/5330	Geomorphology	4
GEOG 2260	Environmental Resource Management	3
GEOG 2410	Geographic Information Systems I	3

RTNL 4320	Financial Resource Management in Recreation, Tourism and Nonprofit Leadership	3
HIST 4170/5170	U.S. Environmental History	3
Total Hours		**31**

* For students pursuing the Environmental Resource Management B.A. degree, the Department of Biology will waive the BIOL 2052 and CHEM 1120 prerequisites for enrollment into BIOL 3100.

Encouraged Certificates: Certificate programs that are appropriate to couple with the ERM major and help to expand specific, relevant experiences for students.

- GIS & Cartography (Department of Geography)

- Sustainability (Interdisciplinary)

- Outdoor Recreation (Department of Health, Recreation and Community Services)

- Tourism (Department of Health, Recreation and Community Services)

- Nonprofit Management Certificate (Department of Health, Recreation and Community Services)

- Environmental Health Certificate (Department of Health, Recreation and Community Services)

- Public History (Department of History)

Ecosystems Track

A total of 31-32 hours are needed for this track. There are 11-12 hours of required courses. In addition, student select courses from all three elective categories (A, B, & C) to accumulate to a minimum of 20 hours. At least one course must be taken from each elective category.

Required		
BIOL 4168/5168	Ecology **	4
CHEM 1120	General Chemistry II §	4
MATH 1140	Precalculus	3-4
or STAT 1772	Introduction to Statistical Methods	
Electives:		**20**
Category A - Content Management Related Courses (pick at least 1 course)		
BIOL 4105/5105	Wildlife Ecology and Management **	
BIOL 4108/5108	Biodiversity Conservation Policy **	
BIOL 4167/5167	Conservation Biology **	
BIOL 4180/5180	Restoration Ecology **	
Category B - Content Related Courses (pick at least 1 course)		
BIOL 3109/5109	Plants of North America	
BIOL 3160	Field Zoology of Vertebrates *	
BIOL 3170	Entomology *	
BIOL 4157/5157	Biostatistics **	
BIOL 4164/5164	Mammalogy **	
BIOL 4172/5172	Developmental Plant Anatomy **	
GEOG 4310/5310	GIS Applications: (Variable Topic)	
GEOG 4320/5320	Geographic Information Systems II	
Category C - Cognates (pick at least 1 course)		
EARTHSCI 1200	Elements of Weather	
ENGLISH 4785/5785	Applied Writing: Projects, Grants and Careers ^	
GEOG 2210	Modern Climate Change: Evidence and Predictions	
GEOG 2240	Natural Hazards and Disasters	
GEOG 3179	Cooperative Education in Geography ^	
or BIOL 3179	Cooperative Education	
or EARTHSCI 3430	Internship	
or RTNL 4510	Internship in Recreation, Tourism and Nonprofit Leadership	
or PH 4180	Internship	
GEOG 3220	Environmental Geography: Variable Topic ^	
GEOG 4220/5220	Soils and Landscapes	
GEOG 4270/5270	Science of Scenery	
GEOG 4240/5240	The Ice Age ^	
GEOG 4250/5250	Laboratory Methods in Environmental Geography	
GEOG 4370/5370	Remote Sensing of the Environment	
MGMT 3183	Leadership Skills ^	
MGMT 3185	Project Management ^	
RTNL 2120	Foundations of Tourism	
RTNL 4553/5553	Trends and Issues in Outdoor Recreation	
RTNL/HIST 4556	History of Outdoor Recreation	
Total Hours		**31-32**

* For students pursuing the Environmental Resource Management B.A. degree, the Department of Biology will waive BIOL 2052 and CHEM 1120 for BIOL 3000-level courses.

** For students pursuing the Environmental Resource Management B.A. degree, the Department of Biology will waive BIOL 3140 as a prerequisite for BIOL 4000-level courses.

§ Students pursuing the Ecosystems track can take CHEM 1110 and CHEM 1120 (8 credits) OR CHEM 1130 (5 credits). CHEM 1130 is designed for students with exceptional preparation in Chemistry. Taking CHEM 1130 changes the total degree requirement from 62-63 credit hours to 59-60 credit hours.

^ These courses have additional prerequisites as follows:
ENGLISH 4785/5785 has prerequisites of ENGLISH 2770 or consent of instructor; junior standing.
GEOG 3220 has a prerequisite of GEOG 1120 or GEOG 1210 or GEOG 2210 or GEOG 1110 or consent of instructor.
GEOG 4240/5240 has prerequisites of GEOG 1210; GEOG 2210; EARTHSCI 1300; or consent of instructor; junior standing.
MGMT 3183 has a prerequisite of MGMT 3965/5965.

GEOG 3179 has prerequisites of 15 hours of geography at UNI; cumulative GPA of 2.50; junior standing; consent of department.
RTNL 4320 has prerequisites of three (3) credit hours of RTNL 31XX; junior standing. For students pursuing the Environmental Resource Management major, Department of Health, Recreation and Community Services will waive the prerequisites of 3 hours of RTNL 31XX.
RTNL 4510 has prerequisites of senior standing; consent of Internship Coordinator and a corequisite of RTNL 4520. For students pursuing the Environmental Resource Management major, Department of Health, Recreation and Community Services will waive this corequisite.
PH 4180 has prerequisites of PH 3170; senior standing; 2.50 cumulative GPA; consent of Division of Health Promotion and Education Coordinator of Student Field Experiences.

Geosystems Track

A total of 30 hours are needed for this track, with a minimum of 21 hours from the Primary Focus group and 9 hours from the Secondary Focus group.

Electives

Primary Focus - Content Related Courses		**21**
EARTHSCI 1200	Elements of Weather	
EARTHSCI 3350/535	Environmental Hydrology ^	
EARTHSCI 3322	Earth Materials ^	
GEOG 2210	Modern Climate Change: Evidence and Predictions	
GEOG 2240	Natural Hazards and Disasters	
GEOG 3220	Environmental Geography: Variable Topic * ^	
or		
EARTHSCI 3345/534	Environmental Geology ***	
GEOG 4220/5220	Soils and Landscapes	
GEOG 4230/5230	Rivers	
GEOG 4250/5250	Laboratory Methods in Environmental Geography	
GEOG 4370/5370	Remote Sensing of the Environment	
RTNL 2130	Foundations of the Nonprofit Sector	
RTNL 4553/5553	Trends and Issues in Outdoor Recreation	
RTNL 4554/5554	Managing Recreation Impacts on the Natural Environment	
Secondary Focus - Management Cognates		**9**
BIOL 4105/5105	Wildlife Ecology and Management **	
BIOL 4180/5180	Restoration Ecology **	
EARTHSCI 3325/532	Sedimentary Geology ****	
EARTHSCI 3360/536	Field and Laboratory Methods in Hydrology	
ECON 3225/5225	Environmental Economics ^	
ENGLISH 4785/5785	Applied Writing: Projects, Grants and Careers ^	
GEOG 4170/5170	Climate Action Planning	
GEOG 4240/5240	The Ice Age *	
GEOG 4270/5270	Science of Scenery	
GEOG 4310/5310	GIS Applications: (Variable Topic) ^	
GEOG 4320/5320	Geographic Information Systems II	
RTNL 2120	Foundations of Tourism	
RTNL/HIST 4556	History of Outdoor Recreation	
RTNL 4776/5776	Eco, Adventure and Sport Tourism	
MGMT 3185	Project Management ^	
POL AMER 3172	Public Budgeting ^	
BIOL 3179	Cooperative Education ^	
or GEOG 3179	Cooperative Education in Geography	
or EARTHSCI 3430	Internship	
or RTNL 4510	Internship in Recreation, Tourism and Nonprofit Leadership	
or PH 4180	Internship	
Other courses as approved by advisors and program director		
Total Hours		**30**

* * For students pursuing the Geosystems Track, the Geography Department will accept GEOG 1210 and GEOG 1211 or EARTHSCI 1300 as the prerequisite for enrollment into all listed Geography courses except GEOG 4310/5310 and GEOG 4320/5320.

**** The Biology Department will waive BIOL 3140 as a prerequisite for BIOL 4105/5105 and BIOL 4180/5180.

***** The Earth and Environmental Sciences Department will accept GEOG 1210 and GEOG 1211 as substitutes for courses that require EARTHSCI 1300.

****** The Earth and Environmental Sciences Department will waive the requirement of EARTHSCI 1320 for EARTHSCI 3325/5325.

The Department of Health, Recreation and Community Services will waive RTNL 2120 as a prerequisite for RTNL 4776/5776.

^ ^ These courses have additional prerequisites as follows:
EARTHSCI 3322 has a prerequisite of EARTHSCI 1300.
EARTHSCI 3350/5350 has prerequisites of EARTHSCI 1300; junior standing.
GEOG 3220 has a prerequisite of GEOG 1120 or GEOG 1210 or GEOG 2210 or GEOG 1110 or consent of instructor.
ECON 3225/5225 has prerequisites of ECON 1041, ECON 1051; junior standing.
ENGLISH 4785/5785 has prerequisites of ENGLISH 2770 or consent of instructor; junior standing.
GEOG 4310/5310 has prerequisites of GEOG 2410; junior standing.
GEOG 4320/5320 has prerequisites of GEOG 2410 or consent of instructor; junior standing.
POL AMER 3172 has prerequisites of POL AMER 1014; POL AMER 1048.
GEOG 3179 has prerequisites of 15 hours of geography at UNI; cumulative GPA of 2.50; junior standing; consent of department.
RTNL 4510 has prerequisites of senior standing; consent of Internship Coordinator and a corequisite of RTNL 4520. For students pursuing the Environmental Resource Management major, the Department of Health Recreation and Community Services will waive this corequisite.

PH 4180 has prerequisites of PH 3170; senior standing; 2.50 cumulative GPA; consent of Division of Health Promotion and Education Coordinator of Student Field Experiences.

Resource Administration Track

A total of 30 hours are needed for this track, with a minimum of 21 hours from the Primary Focus group and 9 hours from the Secondary Focus group.

Primary Focus - Content Related Courses		**21**
GEOG 2210	Modern Climate Change: Evidence and Predictions	
GEOG 2240	Natural Hazards and Disasters	
GEOG 4170/5170	Climate Action Planning	
PH 3720	Environmental and Occupational Health Regulations	
RTNL 2130	Foundations of the Nonprofit Sector	
RTNL 3337	Human Resource Development for Recreation, Tourism and Nonprofit Leadership	
RTNL 4310/5310	Areas and Facilities in Recreation, Tourism and Nonprofit Leadership	
RTNL 4554/5554	Managing Recreation Impacts on the Natural Environment	
RTNL/HIST 4556	History of Outdoor Recreation	
RTNL 4776/5776	Eco, Adventure and Sport Tourism	
Secondary Focus - Cognates		**9**
BIOL 4167/5167	Conservation Biology **	
GEOG 4220/5220	Soils and Landscapes	
GEOG 4230/5230	Rivers	
GEOG 4250/5250	Laboratory Methods in Environmental Geography	
GEOG 4270/5270	Science of Scenery	
GEOG 4310/5310	GIS Applications: (Variable Topic)	
GEOG 4320/5320	Geographic Information Systems II	
GEOG 4370/5370	Remote Sensing of the Environment	
ENGLISH 4775/5775	Applied Writing: Specialized Documents ^	
or ENGLISH 4785/5785	Applied Writing: Projects, Grants and Careers	
PH 3710	Environmental Health Science	
RTNL 2120	Foundations of Tourism	
RTNL 4552/5552	Theory and Practice of Outdoor Education	
RTNL 4553/5553	Trends and Issues in Outdoor Recreation	
RTNL 4779/5779	Community Planning Workshop	
MGMT 3185	Project Management ^	
POL AMER 3172	Public Budgeting ^	
GEOG 3179	Cooperative Education in Geography ^	
or BIOL 3179	Cooperative Education	
or EARTHSCI 3430	Internship	
or RTNL 4510	Internship in Recreation, Tourism and Nonprofit Leadership	
or PH 4180	Internship	
Other courses as approved by advisors and program director		
Total Hours		**30**

* * The Biology Department will waive BIOL 3140 as a prerequisite for BIOL 4167/5167.

**** The Geography Department and the Department of Health, Recreation and Community Services will waive RTNL 2120 as a prerequisite for enrollment into RTNL 4310/5310.

^ ^ These courses have additional prerequisites as follows:
RTNL 4776/5776 has prerequisites of RTNL 2120 or consent of instructor; junior standing.
ENGLISH 4775/5775 has prerequisites of MGMT 2080 or ENGLISH 2770 or consent of instructor; junior standing.
ENGLISH 4785/5785 has prerequisites of ENGLISH 2770 or consent of instructor; junior standing.
POL AMER 3172 has prerequisites of POL AMER 1014; POL AMER 1048.
GEOG 3179 has prerequisites of 15 hours of geography at UNI; cumulative GPA of 2.50; junior standing; consent of department.
RTNL 4510 has prerequisites of senior standing; consent of Internship Coordinator and a corequisite of RTNL 4520. For students pursuing the Environmental Resource Management major, the Department of Health, Recreation and Community Services will waive this corequisite.
PH 4180 has prerequisites of PH 3170; senior standing; 2.50 cumulative GPA; consent of Division of Health Promotion and Education Coordinator of Student Field Experiences.

Environmental Compliance Track

A total of 32 hours need for this focus area, with 15 hours of required courses, a minimum of 10 hours from the Primary Focus group and 7 hours from the Secondary Focus group.

Required		
ECON 1041	Principles of Macroeconomics	3
ECON 1051	Principles of Microeconomics	3
ECON 3225/5225	Environmental Economics	3
PH 3720	Environmental and Occupational Health Regulations	3
PHIL 2550	Environmental Ethics	3
Primary Focus - Content Related Courses		**10**
EARTHSCI 1200	Elements of Weather	
EARTHSCI 1400	Introduction to Environmental Earth Science	
EARTHSCI 3230/523	Air Quality ^	
EARTHSCI 3345/534	Environmental Geology *	
or		

GEOG 3220	Environmental Geography: Variable Topic	
EARTHSCI 3350/535	Environmental Hydrology *	
Secondary Focus - Cognates		**7**
EARTHSCI 3240/524	Air Quality Modeling ^	
EARTHSCI 3250/525	Measurement and Analysis of Air Quality ** ^	
EARTHSCI 3325/532	Sedimentary Geology ***	
EARTHSCI 3355/535	Hydrogeology *	
GEOG 4220/5220	Soils and Landscapes	
GEOG 4230/5230	Rivers	
GEOG 4370/5370	Remote Sensing of the Environment	
PH 3710	Environmental Health Science	
RTNL 4554/5554	Managing Recreation Impacts on the Natural Environment	
MGMT 3153	Organizational Management *	
MGMT 3185	Project Management ^	
POL AMER 1048	Introduction to Public Administration	
GEOG 3179	Cooperative Education in Geography ^	
or BIOL 3179	Cooperative Education	
or EARTHSCI 343	Internship	
or RTNL 4510	Internship in Recreation, Tourism and Nonprofit Leadership	
or PH 4180	Internship	
Other courses as approved by advisors and program director		
Total Hours		**32**

* * The Earth and Environmental Sciences Department will accept GEOG 1210 and GEOG 1211 as a substitute for courses that require EARTHSCI 1300.

** ** The Earth and Environmental Sciences Department will waive EARTHSCI 3230/5230 as a prerequisite for enrollment into EARTHSCI 3250/5250.

*** *** The Earth and Environmental Sciences Department will waive the requirement for EARTHSCI 1320 for EARTHSCI 3325/5325.

^ ^ These courses have additional prerequisites as follows:
GEOG 3220 has a prerequisite of GEOG 1120 or GEOG 1210 or GEOG 2210 or GEOG 1110 or consent of instructor.
EARTHSCI 3240/5240 has prerequisites of EARTHSCI 1200; junior standing.
EARTHSCI 3250/5250 has prerequisites of EARTHSCI 1200; junior standing and a prerequisite or corequisite of EARTHSCI 3230/5230.
GEOG 3179 has prerequisites of 15 hours of geography at UNI; cumulative GPA of 2.50; junior standing; consent of department.
RTNL 4510 has prerequisites of senior standing; consent of Internship Coordinator and a corequisite of RTNL 4520. For students pursuing the Environmental Resource Management major, the Department of Health, Recreation and Community Services will waive this corequisite.
PH 4180 has prerequisites of PH 3170; senior standing; 2.50 cumulative GPA; consent of Division of Health Promotion and Education Coordinator of Student Field Experiences.

Environmental Science Major

The Environmental Science major requires a minimum of 120 total hours to graduate. This total includes UNIFI/General Education requirements and the following specified major requirements, plus electives to complete the minimum of 120 hours.

The Environmental Science major is intended as a hands-on program with all students having a common curricular core centered on Geology and Meteorology, as well as Geography, Biology, Environmental Policies, Mathematics, and Chemistry. Following the common core courses students take supporting courses in areas of professional interest – Air Quality, Geoscience, or Hydrology. Each has a range of courses that provide students with experience in evaluating and responding to environmental issues. Please contact the Earth and Environmental Sciences Office for a list of current supporting courses.

Required		
BIOL 2051	General Biology: Organismal Diversity	4
CHEM 1110	General Chemistry I	4
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 1300	Introduction to Geology	4
EARTHSCI 3230/5230	Air Quality	4
EARTHSCI 3345/5345	Environmental Geology	3
EARTHSCI 3350/5350	Environmental Hydrology	3
EARTHSCI 3430	Internship	2
or EARTHSCI 4400	Undergraduate Research in Earth and Environmental Science	
GEOG 2410	Geographic Information Systems I	3
MATH 1140	Precalculus	4
or MATH 1420	Calculus I	
STAT 1772	Introduction to Statistical Methods	3
Electives:		25
Primary Focus - At least 18 hours from the following:		
EARTHSCI 1320	Earth History	
EARTHSCI 1400	Introduction to Environmental Earth Science	
EARTHSCI 3210/521	Meteorology	
EARTHSCI 3240/524	Air Quality Modeling	
EARTHSCI 3250/525	Measurement and Analysis of Air Quality	
EARTHSCI 3322	Earth Materials	
EARTHSCI 3323	Geochemistry of the Land	
EARTHSCI 3325/532	Sedimentary Geology *	
EARTHSCI 3327/532	Paleoclimatology *	
EARTHSCI 3330/533	Geomorphology	
EARTHSCI 3336	Natural Resources and Civilizations	
EARTHSCI 3340/534	Oceanography	

EARTHSCI 3355/5355	Hydrogeology
EARTHSCI 3360/5360	Field and Laboratory Methods in Hydrology
EARTHSCI 3365/5365	Hydrology Seminar
EARTHSCI 3370	Geologic Field Methods
Secondary Focus - At least 7 hours from the following:	
CHEM 1120	General Chemistry II
ECON 3225/5225	Environmental Economics *
GEOG 2210	Modern Climate Change: Evidence and Predictions
GEOG 2260	Environmental Resource Management
GEOG 4320/5320	Geographic Information Systems II
GEOG 4370/5370	Remote Sensing of the Environment
GEOG 4115/5115	Climate Change and Social Justice
GEOG 4220/5220	Soils and Landscapes
GEOG 4230/5230	Rivers
PH 3710	Environmental Health Science
PHIL 2550	Environmental Ethics
PHYSICS 1511	General Physics I
TECH CM 1015	Introduction to Sustainability
Other courses approved by the Department	
Total Hours	**62**

* ECON 3225/5225 has prerequisites of ECON 1041; ECON 1051; junior standing.
EARTHSCI 3325/5325 has a prerequisite or corequisite of EARTHSCI 1320 and prerequsite junior standing.
EARTHSCI 3327/5327 has prerequisites of EARTHSCI 1300 OR GEOG 1210; EARTHSCI 1320 or consent of instructor; junior standing.

Minors

Air Quality Minor

The Air Quality Minor prepares students for careers in governmental regulation of air quality, industrial compliance with the Clean Air Act, and private sector environmental consulting.

Required:		
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 3210/5210	Meteorology	4
EARTHSCI 3230/5230	Air Quality	4
EARTHSCI 3240/5240	Air Quality Modeling	4
EARTHSCI 3250/5250	Measurement and Analysis of Air Quality	4
Electives: 8 hours from the following		8
CHEM 1110	General Chemistry I	
CHEM 1120	General Chemistry II	
CHEM 1130	General Chemistry I-II	
EARTHSCI 3220/5220	Weather Analysis and Forecasting	
GEOG 2210	Modern Climate Change: Evidence and Predictions	
GEOG 2410	Geographic Information Systems I	
Total Hours		**27**

Astronomy Minor

Required:		
EARTHSCI 1100	Astronomy	3
EARTHSCI 3135	Stars, Galaxies and the Universe	3
EARTHSCI 4150/5150	Astrophysics	3
MATH 1420	Calculus I	4
MATH 1421	Calculus II	4
PHYSICS 1701	Physics I for Science and Engineering	4
PHYSICS 1702	Physics II for Science and Engineering	4
Total Hours		**25**

Earth Science Minor

Required	
Courses in Earth Science	20
Total Hours	**20**

Earth Science Minor-Teaching

The Earth Science Minor-Teaching provides for second endorsement approval by the Iowa Board of Educational Examiners and requires first endorsement approval (major) in another Grades 5-12 science discipline, basic science, or all science.

This minor leads to endorsement #153: 5-12 Earth Science. Students must also complete all requirements for a Secondary Science Teaching major, including student teaching.

Required		
Chemistry and Biochemistry:		
CHEM 1110	General Chemistry I	4
Earth Science:		
EARTHSCI 1100	Astronomy	3
EARTHSCI 1110	Astronomy Laboratory	1
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 1210	Elements of Weather Laboratory	1
EARTHSCI 1300	Introduction to Geology	4
EARTHSCI 1320	Earth History	4
Physics:		
PHYSICS 1511	General Physics I	4
Total Hours		**24**

Environmental Assessment Minor

Students in the Environmental Science BA, Environmental Resource Management-Compliance track BA, and the Environmental Science: Earth Science Emphasis BS may not declare this minor.

Required:		
CHEM 1110	General Chemistry I	4
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 1300	Introduction to Geology	4
Electives (11 hours from the following):		11
BIOL 3151	General Microbiology *	
EARTHSCI 3230/523	Air Quality	
EARTHSCI 3240/524	Air Quality Modeling	
EARTHSCI 3250/525	Measurement and Analysis of Air Quality	
EARTHSCI 3323	Geochemistry of the Land	
EARTHSCI 3360/536	Field and Laboratory Methods in Hydrology	
EARTHSCI 3370	Geologic Field Methods	
GEOG 4250/5250	Laboratory Methods in Environmental Geography	
GEOG 4370/5370	Remote Sensing of the Environment	
Total Hours		**22**

* BIOL 3151 has prerequisites of BIOL 2051; BIOL 2052; CHEM 1110 and CHEM 1120, or CHEM 1130.

Environmental Data Analysis Minor

This minor may complement majors in various programs such as Computer Science, Data Science, Statistics, Business, Economics, Geography, Environmental Science, and Earth Science, which will require content in both methods of environmental data collection and data analysis. Students may want to apply their knowledge to investigate areas of interest related to their major, such as social impact of climate change, economic impacts of environmental contamination, management of limited natural resources and policies related to threatened areas.

This minor includes required courses in two UNIFI categories, Quantitative Reasoning and Scientific Reasonings, account for 7 hours.

Required:		
GEOG 2350	Intro to Environmental Data Analysis	3
STAT 1772	Introduction to Statistical Methods	3
Select one of the following options		4
BIOL 1012 & BIOL 1013	Life: The Natural World and Life: The Natural World - Lab	
BIOL 2051	General Biology: Organismal Diversity	
EARTHSCI 1200 & EARTHSCI 1210	Elements of Weather and Elements of Weather Laboratory	
EARTHSCI 1300	Introduction to Geology	
GEOG 1210 & GEOG 1211	Planet Earth and Planet Earth Laboratory	
Electives: At least 12 hours total from Group A and B:		
Group A: Computational/Analytical Methods - select 2 courses		6
BIOL 4157/5157	Biostatistics **	
CS 2150	Computing for Data Science *	
CS 3140/5140	Database Systems *	
ECON 3225/5225	Environmental Economics *	
ECON 3371	Economic and Business Forecasting *	
ECON 3373/5373	Introduction to Econometrics *	
GEOG 2410	Geographic Information Systems I	
PHYSICS 4160/5160	Data Visualization, Modeling and Simulation *	
STAT 3775/5775	Introduction to Mathematical Statistics *	
STAT 3778/5778	Spatial Data Analysis	
STAT 4772/5772	Statistical Computing I	
STAT 4784/5784	Introduction to Machine Learning *	
Group B: Environmental Data Collection Methods - select 2 courses		6
BIOL 4168/5168	Ecology **	
BIOL 4180/5180	Restoration Ecology **	
EARTHSCI 3230/523	Air Quality *	
EARTHSCI 3250/525	Measurement and Analysis of Air Quality *	
EARTHSCI 3323	Geochemistry of the Land *	
EARTHSCI 3345/534	Environmental Geology *	
EARTHSCI 3350/535	Environmental Hydrology *	
EARTHSCI 3355/535	Hydrogeology *	
EARTHSCI 3360/536	Field and Laboratory Methods in Hydrology *	
EARTHSCI 3370	Geologic Field Methods *	
GEOG 2320	Drones for Mapping and Communication	
GEOG 4350/5350	Global Positioning System Field Survey Methods	
GEOG 4370/5370	Remote Sensing of the Environment	
GEOG 4385/5385	Advanced Unmanned Aerial Systems Mapping *	
Total Hours		**22**

* These courses have additional prerequisites as follows:
BIOL 4157/5157 has prerequisites of MATH 1140, or MATH 1120 and MATH 1130, or MATH 1420, or equivalent; BIOL 3100; BIOL 3140; junior standing
CS 2150 has prerequisites of CS 1510; consent of department
CS 3140/5140 has prerequisites of CS 1520; CS 1800; junior standing. For Data science minors the perquisites are of CS 2150; junior standing
ECON 3225/5225 has prerequisites of ECON 1041; ECON 1051; junior standing
ECON 3371 has prerequisites of ECON 1031 or ECON 1041 or ECON 1051 or consent of instructor; junior standing

ECON 3373/5373 has prerequisites of ECON 1041 and ECON 1051, or consent of instructor; junior standing
PHYSICS 4160/5160 has prerequisites of CS 1510; junior standing
STAT 3775/5775 has prerequisites of MATH 3752/5752; junior standing. Prerequisite or corequisite MATH 2422
STAT 3776/5776 has prerequisites of STAT 3775/5775; junior standing
STAT 4784/5784 has prerequisites of CS 1510 or STAT 4772/5772; junior standing; consent of instructor
BIOL 4168/5168, BIOL 4180/5180 have prerequisites of BIOL 3100; BIOL 3140; junior standing
EARTHSCI 3230/5230, EARTHSCI 3240/5240, EARTHSCI 3250/5250 have a prerequisite of EARTHSCI 1200; junior standing
EARTHSCI 3323 has prerequisites of EARTHSCI 1300; CHEM 1110
EARTHSCI 3345/5345, EARTHSCI 3350/5350, EARTHSCI 3355/5355, EARTHSCI 3360/5360 have a prerequisite of EARTHSCI 1300; junior standing
EARTHSCI 3370 has a prerequisite of EARTHSCI 1300
GEOG 4385/5385 have prerequisites GEOG 4370/5370 or consent of instructor; junior standing

** Well prepared students who would like to enroll in BIOL 4157/5157, BIOL 4168/5168 or BIOL 4180/5180 should contact the course instructor about possible waivers.

Environmental Earth Science Minor

Required:		
BIOL 2051	General Biology: Organismal Diversity	4
EARTHSCI 1200	Elements of Weather	3
EARTHSCI 1300	Introduction to Geology	4
EARTHSCI 3230/5230	Air Quality	4
EARTHSCI 3345/5345	Environmental Geology	3
EARTHSCI 3350/5350	Environmental Hydrology	3
GEOG 2410	Geographic Information Systems I	3
Electives: At least 6 credits from the following		6
EARTHSCI 1400	Introduction to Environmental Earth Science	
ECON 3225/5225	Environmental Economics *	
GEOG 2210	Modern Climate Change: Evidence and Predictions	
GEOG 2260	Environmental Resource Management	
GEOG 4370/5370	Remote Sensing of the Environment	
PH 3710	Environmental Health Science	
PHIL 2550	Environmental Ethics	
Total Hours		**30**

* ECON 3225/5225 has prerequisites of ECON 1041 and ECON 1051.

Geology Minor

Required:		
EARTHSCI 1300	Introduction to Geology	4
EARTHSCI 1320	Earth History	4
EARTHSCI 3322	Earth Materials	4
EARTHSCI 3325/5325	Sedimentary Geology	4
EARTHSCI 3330/5330	Geomorphology	4
EARTHSCI 3355/5355	Hydrogeology	3
Electives: choose one of the following:		3-4
EARTHSCI 3323	Geochemistry of the Land	
EARTHSCI 3327/532	Paleoclimatology	
EARTHSCI 3340/534	Oceanography	
EARTHSCI 3370	Geologic Field Methods	
Total Hours		**26-27**

Hydrology Minor

Required:		
EARTHSCI 1300	Introduction to Geology	4
EARTHSCI 1320	Earth History	4
EARTHSCI 3350/5350	Environmental Hydrology	3
EARTHSCI 3355/5355	Hydrogeology	3
EARTHSCI 3360/5360	Field and Laboratory Methods in Hydrology	3
EARTHSCI 3365/5365	Hydrology Seminar	2
Electives - 7 hours from the following:		7
CHEM 1110	General Chemistry I	
EARTHSCI 3210/521	Meteorology *	
EARTHSCI 3325/532	Sedimentary Geology	
EARTHSCI 3330/533	Geomorphology	
GEOG 2410	Geographic Information Systems I	
GEOG 4220/5220	Soils and Landscapes	
GEOG 4370/5370	Remote Sensing of the Environment	
Total Hours		**26**

* EARTHSCI 3210/5210 has a prerequisite of EARTHSCI 1200.