

# ENVIRONMENTAL SCIENCE

The Master of Science in Environmental Science (MSES) is a two-year program designed for students who wish to pursue graduate study on a full or part-time basis so they can balance professional and personal goals. Courses are primarily held in the evening and occasionally on Saturdays. Graduate students in the Department of Natural Sciences are talented and often have significant professional experience. Graduate faculty are highly qualified and experienced, and the educational culture is one in which learning, teaching, and research are emphasized. Pursuing a graduate degree in Environmental Science at UM-Dearborn will result in substantial growth in knowledge, skills, and long-term career potential.

We stress personalized, individual attention to graduate student education and research. The program provides a choice between emphasizing the environmental aspects of biology, chemistry, or geology, or a more broadly focused approach involving courses in each of the above fields. Faculty and students are engaged in the research of environmental issues including: wetlands delineation; the treatment of nitrate contaminated groundwater with microbiological techniques; the impact of land use on groundwater and surface water quality; the use of phytoremediation in the cleanup of polycyclic aromatic hydrocarbon contaminated soil; brownfield investigation and restoration; migration behavior and ecology of birds, and behavioral ecology of spiders and other arthropods; microbial source tracking; the use of microorganisms in biofuel synthesis; and microbial community dynamics and diversity in marine and freshwater sediments.

## Research Facilities

The Department of Natural Sciences has extensive networked computing facilities, including scanners, digitizers and plotters, GIS and groundwater modeling software, GPS equipment, ICP-MS and labs for preparation and chemical analysis of environmental, biological and geological samples. We also have extensive mineralogic and paleontologic collections as well as the Merritt Geode Collections, one of the finest in the world. A focal point for the environmental program on the Dearborn campus is the Environmental Interpretive Center that opened in May, 2001. Rouge River Bird Observatory (RRBO) studies the importance of urban areas to birds, especially migratory birds. We are the longest-running, full-time urban bird research station in North America.

## Admission and Prerequisites

Regular admission to the MSES program is extended to students with a Bachelor's Degree in environmental science biology, chemistry and geology from an accredited program who have completed all program prerequisites and a cumulative undergraduate GPA 3.1 or higher (based on a 4.0 scale). The Graduate Record Exam (GRE) is not required if these conditions have been met. **Conditional admission to the MSES program is extended to students with an undergraduate degree in some other field if they meet other criteria (completed the GRE, have written a convincing letter explaining their commitment to the degree and have obtained strong letters of recommendation) and can complete program prerequisites within one year of acceptance.** Minimum program prerequisites include one year of general chemistry and one upper division course in chemistry – typically quantitative methods analysis or organic chemistry; introductory courses in biology and geology, a field course in either biology or geology; one year (two semesters) of calculus, a one-semester course in organic chemistry and a course in statistics. Deficiencies may be satisfied by completing prerequisite courses at UM-

Dearborn or at another school with the approval of the graduate program committee.

Each applicant should submit the following:

1. Official transcripts from all universities attended.
2. A one-page statement of purpose describing the applicant's career goals and personal objectives in pursuing the program.
3. Three letters of recommendation.
4. Students whose native language is not English are also required to satisfy the English Language Requirements for Admission. Details can be found in the Graduate Admissions (<http://catalog.umd.umich.edu/graduate/graduate-admissions/>) section.

Application instructions can be found at: [umdearborn.edu/gradapplynow](http://umdearborn.edu/gradapplynow)

For more information, visit the MSES website or call 313-583-6321.

## Degree Requirements

The MSES degree requires 30 semester hours of graduate coursework that can be satisfied by one of three options:

- Plan A. Thesis Option 24 credit hours (500 level or above) plus ESCI 699. A thesis will be based on original research. (Preferred by the environmental consulting industry)
- Plan B. Project Option 27 credit hours (500 level or above) plus ESCI 698. A project will be based on library/field/laboratory research or classroom exercises demonstrating analysis and interpretation of scientific data.
- Plan C. Coursework Option 30 credit hours (500 level or above) (Not recommended for students interested in doctoral degrees).

The non-thesis M.S. program has an emphasis on coursework, while the thesis-based/project-based degree has an emphasis on both coursework and original research. Thesis-based M.S. students will experience the excitement of performing guided research.

A cumulative grade point average of B or better is required. For more information, visit the MSES website.

## Specific Course Requirement

Code	Title	Credit Hours
<b>Core Courses</b>		
BIOL 508 or BIOL 514	Invasive Species Ecology Applied Ecology	3
CHEM 548	Environmental Chemistry	3
ESCI 572	Environmental Communications	3
ESCI 574	Watershed Analysis	3
GEOL 550	Glacial Geology	3
<b>Electives</b>		
Select fifteen credit hours from:		15
Department of Natural Sciences:		
BIOL 508	Invasive Species Ecology	
BIOL 515	Aquatic Ecosystems	
BIOL 516	Limnology	
BIOL 519	Behavior and Evolution	
BIOL 522	Conservation Biology	
BIOL 524	Biology of Spiders	

BIOL 545	Restoration Ecology
BIOL 552	Med & Env Toxicology
BIOL 556	Behavioral Biology
BIOL 561	Advances in Cell Biology
BIOL 590	Topics in Biology
CHEM 535	Green Chemistry
CHEM 590	Topics in Chemistry
ENST 574	Environmental Education
ESCI 504	Field Studies in Env Science
ESCI 525	Soil in the Environment
ESCI 572	Environmental Communications
ESCI 585	Spatial Analysis and GIS
ESCI 595	Topics in Environmentl Science
ESCI 597	Off-Campus Independent Study
ESCI 599	On-Campus Independent Study
ESCI 698	MSES Master's Project
ESCI 699	MSES Master's Thesis
GEOL 510	Urban Geology
GEOL 560	Structural and Engineering Geology
GEOL 570	Geochemistry
GEOL 574	Urban Watersheds
GEOL 575	Contaminant Hydrogeology
GEOL 577	Geology Field Methods
GEOL 578	Geology of the National Parks
GEOL 587	Groundwater Modeling
GEOL 590	Topics in Earth Science
MICR 505	Applied & Environ Microbiology
Other Departments:	
LIBS 586	Ecological Economics
STAT 530	Applied Regression Analysis
STAT 545	Reliability & Survival Analsy
STAT 555	Environmental Statistics

Total Credit Hours

30

## Three Options for a MSES Degree

- **Plan A. Thesis Option** 24 credits hours (500 or above level) plus 6 credits ESCI 699. A thesis will be based on original research. (Preferred by the environmental consulting industry.)
- **Plan B. Project Option** 27 credit hours (500 level or above) plus ESCI 698. A project will be based on library/field/laboratory research or classroom exercises demonstrating analysis and interpretation of scientific data.
- **Plan C. Coursework Option** 30 credit hours (500 level or above) (Not recommended for students interested in doctoral degrees).

### ESCI 504 Field Studies in Env Science 2 Credit Hours

A systematic analysis of the environment. This course will focus on the analysis of the Rouge River Watershed as an ecological unit. The student will make intensive analyses of the river water and the surrounding land surface at selected sites. The results will provide a composite of the water quality and land use of the various tributaries. Emphasis will be placed on proper sampling and testing techniques, field and lab safety procedures, aquatic chemistry, biological organisms as indicators of pollution, and the role of wastewater dumping on the watershed.

### ESCI 525 Soil in the Environment 3 Credit Hours

The study of soil in the environment, including its formation, classification, physical attributes and engineering properties with an emphasis on soil-water statics and dynamics, chemical attributes and processes. Students are expected to have background knowledge of physical geology. The course will include field trips and field work, including the collection of soil samples from the Universities natural area. The course will also include a laboratory component in which students will perform a variety of test, e.g. bulk density, engineering properties on the soil samples collected. the course will typically be team taught. (S, AY)

**Prerequisite(s):** GEOL 118

**Restriction(s):**

Can enroll if Level is Rackham or Graduate

Can enroll if College is Education, Health, and Human Services or Business or Engineering and Computer Science or Arts, Sciences, and Letters

### ESCI 572 Environmental Communications 3 Credit Hours

Preparation and presentation of both oral and written technical abstracts and reports, including environmental newsletters, thesis, and media releases. Professional scientists must be able to effectively communicate ideas and concepts to other scientists and to the general public. This course will provide the foundations in learning how to communicate ideas effectively and succinctly. (F, YR)

**Restriction(s):**

Can enroll if Class is Senior or Graduate

Can enroll if College is Arts, Sciences, and Letters

### ESCI 574 Watershed Analysis 3 Credit Hours

An interdisciplinary study of watersheds, the most commonly used bio-regional unit. The course integrates the analysis of many factors which contribute to the character of watersheds, including bedrock and surficial geology, surface and groundwater hydrology, social history, land use history, water quality analysis, biological diversity, laws and regulations, management models, drinking water and wastewater systems, best management practices, and educational programs. The Rouge River watershed will serve as the primary case study.

**Restriction(s):**

Can enroll if Class is Graduate

### ESCI 585 Spatial Analysis and GIS 3 Credit Hours

Application of the principles of Spatial Analysis and the use of Geographic Information Systems as a research tool in Environmental Science. Emphasis will be placed on the use of commercially available software including: ESRI's ArcView GIS, Golden Software's Surfer and Adobe PhotoShop. Emphasis will also be placed on the use of the Michigan spatial data warehouse program and the Michigan geographic framework program for metadata specific to Michigan. (AY).

**Restriction(s):**

Can enroll if Class is Graduate

### ESCI 595 Topics in Environmentl Science 3 Credit Hours

Problems or readings on specific topics or subjects in environmental science. (YR)

**Restriction(s):**

Can enroll if Class is Senior or Graduate

Can enroll if College is Arts, Sciences, and Letters

**ESCI 595G Topics in Environmental Sci 3 Credit Hours**

Topic: Soil in the Environment. A study of the textural and chemical classification of soil as well as the biologic, engineering and geologic aspects of soil science including applications to agriculture and agronomic science. The course will explore topics such as soil formation, soil-water statics and dynamics, soil-energy balances, soil fertility and plant nutrition, biodiversity, soil and water management, soil pollution and remediation.

**ESCI 597 Off-Campus Independent Study 1 to 3 Credit Hours**

Provides opportunity for qualified graduate students in the MSES program to pursue independent research under the direction of a graduate faculty member off campus. A written proposal describing the project (including the nature of the project itself, dates, where the project will be done and the faculty member supervising the project) must be approved by the MSES program director/committee before the student can register for the course. Project must be appropriate to the student's chosen track. It must be designed to produce a scholarly paper, papers, or other evidence(s) that reflect significant results from the course (F, W, S).

**Restriction(s):**

Can enroll if Class is Graduate

**ESCI 599 On-Campus Independent Study 1 to 3 Credit Hours**

Provides opportunity for qualified graduate students in the MSES program to pursue independent research under the direction of a graduate faculty member. A written proposal describing the project (including the nature of the project itself, dates, and the supervising faculty member) must be submitted to the Program Director/committee for approval before the student can register for the course. Project must be appropriate to the student's chosen track. It must be designed to produce a scholarly paper, papers, or other evidence(s) that reflect significant results from the course. (F, W, S).

**Restriction(s):**

Can enroll if Class is Graduate

**ESCI 698 MSES Master's Project 3 Credit Hours**

Intended for students who present a plan for a project using methods of intellectual exploration and analysis. Possible projects include gathering data through laboratory or field based studies, using interviews and survey instruments to gauge human responses. They should involve creative representations, writing, and other forms of interdisciplinary analysis. To be carried out under the general supervision of a member of the graduate faculty in Natural Sciences. Project plan must be approved by the MSES Program Director/committee before student registers for this course. (F, W, S).

**Restriction(s):**

Can enroll if Class is Graduate

**ESCI 699 MSES Master's Thesis 1 to 6 Credit Hours**

MSES students electing this thesis option in the last stage of the program will work under the general supervision of a member of the graduate faculty in Natural Sciences, but will plan and carry out the work independently. Prospectus and thesis plan must be approved by the MSES Program Director/committee before student registers for this course. (F, W, S).

**Restriction(s):**

Can enroll if Class is Graduate

The following abbreviations are used to denote the frequency of offering: (F) fall term; (W) winter term; (S) summer term; (F, W) fall and winter terms; (YR) once a year; (AY) alternating years; (OC) offered occasionally

\* An asterisk denotes that a course may be taken concurrently.

Frequency of Offering