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.

With approximately 40 students enrolled, 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 or probationary 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 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 which can be found in the General Information section of this catalog.

Application instructions can be found at: umdearborn.edu/gradapplynow

For more information, visit the MSES website (https://umdearborn.edu/casl/graduate-programs/programs/master-science-environmental-science) or call 313-583-6321.

Advanced Standing

Up to six graduate credit hours (grade of B or better) may be transferred from another accredited institution as specified in the Horace H. Rackham School of Graduate Studies regulations. Up to one-half the minimum number of credit hours required for your master’s or professional degree from U-M/non-Rackham departments and programs (including Ann Arbor, Dearborn and Flint) may be transferred.

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.

The general master’s degree requirements on the Rackham School of Graduate Studies website (http://www.rackham.umich.edu/current-students/policies/academic-policies) are to be considered as degree requirements. In addition, a cumulative grade point average of B or better is required. For more information, visit the MSES website (https://umdearborn.edu/casl/graduate-programs/programs/master-science-environmental-science).

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).

### Specific Course Requirements

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit</th>
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<tr>
<td><strong>Core Courses</strong></td>
<td><strong>Title</strong></td>
<td><strong>Credit</strong></td>
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<tr>
<td>BIOL 508</td>
<td>Invasive Species Ecology</td>
<td>3</td>
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<tr>
<td>or BIOL 514</td>
<td>Applied Ecology</td>
<td>3</td>
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<tr>
<td>CHEM 548</td>
<td>Environmental Chemistry</td>
<td>3</td>
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<tr>
<td>ESCI 572</td>
<td>Environmental Communications</td>
<td>3</td>
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<td>ESCI 574</td>
<td>Watershed Analysis</td>
<td>3</td>
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<td>GEOL 550</td>
<td>Glacial Geology</td>
<td>3</td>
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<tr>
<td><strong>Electives</strong></td>
<td><strong>15</strong></td>
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<td>Select fifteen credit hours from:</td>
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<td>Department of Natural Sciences:</td>
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<tr>
<td>BIOL 508</td>
<td>Invasive Species Ecology</td>
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<td>BIOL 515</td>
<td>Aquatic Ecosystems</td>
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<td>BIOL 516</td>
<td>Limnology</td>
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<td>BIOL 519</td>
<td>Behavior and Evolution</td>
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<td>BIOL 522</td>
<td>Conservation Biology</td>
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<td>BIOL 524</td>
<td>Biology of Spiders</td>
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<td>BIOL 545</td>
<td>Restoration Ecology</td>
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<td>BIOL 550</td>
<td>Med &amp; Env Toxicology</td>
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<td>BIOL 555</td>
<td>Behavioral Biology</td>
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<td>BIOL 561</td>
<td>Advances in Cell Biology</td>
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<td>BIOL 590</td>
<td>Topics in Biology</td>
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<td>CHEM 535</td>
<td>Green Chemistry</td>
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<td>CHEM 590</td>
<td>Topics in Chemistry</td>
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<td>ENST 574</td>
<td>Environmental Education</td>
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<tr>
<td>ESCI 504</td>
<td>Field Studies in Env Science</td>
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<tr>
<td>ESCI 525</td>
<td>Soil in the Environment</td>
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<tr>
<td>ESCI 572</td>
<td>Environmental Communications</td>
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<tr>
<td>ESCI 585</td>
<td>Spatial Analysis and GIS</td>
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<td>ESCI 595</td>
<td>Topics in Environmental! Science</td>
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<td>ESCI 597</td>
<td>Off-Campus Independent Study</td>
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<td>ESCI 698</td>
<td>MSES Master's Project</td>
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<td>MSES Master's Thesis</td>
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<td>GEOL 510</td>
<td>Engineering Geology</td>
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<td>GEOL 560</td>
<td>Geochemistry</td>
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<td>GEOL 570</td>
<td>Urban Watersheds</td>
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<td>GEOL 574</td>
<td>Contaminant Hydrogeology</td>
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<td>GEOL 575</td>
<td>Geology Field Methods</td>
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<td>GEOL 577</td>
<td>Geology of the National Parks</td>
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<td>GEOL 578</td>
<td>Groundwater Modeling</td>
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<td>GEOL 590</td>
<td>Topics in Earth Science</td>
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<td>MICR 505</td>
<td>Applied &amp; Environ Microbiology</td>
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<td>LIBS 586</td>
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**Total Credit Hours**: 30

**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 University's 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 Graduate or Rackham
Can enroll if College is Engineering and Computer Science or Business or Education, Health, and Human Services 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 bioregional 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 Environmental 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

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

Frequency of Offering
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