ENVIRONMENTAL SCIENCES GRADUATE PROGRAM
AREA OF CONCENTRATION IN QUANTITATIVE ANALYSIS

PURPOSE
The Area of Concentration of Quantitative Analysis is designed for students with interests in mathematics, statistics or computing who wish to augment their quantitative skills, study the use of those skills in environmental research, and explore a specific field(s) of application in some depth. The goal is to train environmental scientists who combine conversance in mathematics, statistics and computing with a thorough grounding in the subject matter of a specific area, including an awareness of the strengths and limitations of data collected in that area.

In addition to satisfying a basic requirement in statistics, students select from courses in quantitative analysis, including the planning of experimental and observational studies, the analysis of data accruing from such studies, and the quantitative modeling of natural systems. Courses in a science focal area of their choice are also required. Entering students should have at least one year of college-level calculus, and sufficient background in an environmental science to take graduate courses in their chosen science focal area.

PROGRAM OF STUDY
Course work is divided into 6 categories: ES Core courses, Statistics Core courses, Quantitative Analysis courses, Science Focal Area courses, Elective courses, and Thesis. Total credits required are a minimum of 45 Cr for the M.S. and M.A. degree and 108 Cr for the Ph.D. degree. Typical Programs of Study will include minimum credits as follow:

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>M.S. &amp; M.A. Degrees</th>
<th>Ph. D. Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES Core Courses</td>
<td>9-12 Cr</td>
<td>10-12 Cr</td>
</tr>
<tr>
<td>Statistics Core Courses</td>
<td>12 Cr</td>
<td>12 Cr</td>
</tr>
<tr>
<td>Quantitative Analysis Courses</td>
<td>9 Cr</td>
<td>18-32 Cr</td>
</tr>
<tr>
<td>Science Focal Area Courses</td>
<td>6-9 Cr</td>
<td>12-18 Cr</td>
</tr>
<tr>
<td>Electives</td>
<td>0 Cr</td>
<td>0-20 Cr</td>
</tr>
<tr>
<td>Thesis</td>
<td>6-9 Cr</td>
<td>36-56 Cr</td>
</tr>
<tr>
<td>Total</td>
<td>45 Cr</td>
<td>108 Cr</td>
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</tbody>
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CORE COURSES
9-12 Cr. for the M.S and M.A. degree (required are ENSC 515, 520, 508 and one class from the approved list of core courses below) and 10-12 Cr. for the Ph. D. degree. (Required are ENSC 515, 520, 508 and classes from the approved list of core courses below). These courses include Environmental Perspectives, Environmental Analysis, Environmental Profiles, and the Joint-Campus Workshop in Environmental Science, Studies, and Policy.

Approved Core Course List:
- ANTH 581 Natural Resources and Community Values
- ANTH 582 World Food and the Cultural Implications of International Development
- BI 570 Community Structure and Analysis
- BI 670 Community Structure and Analysis
- CE 513 GIS in Water Resources
- Comm 540 Theories of Conflict and Conflict Management
- EC 539 Public Policy Analysis
- FOR 561 Forest Policy Analysis
- FS520 Posing Researchable Questions
- FS521 Natural Resource Research Plan
- FS565 Forest Ecosystem Management
- FS646 Ecosystem Analysis and Evaluation
- FW515 Model Selection and Inference
- GEO 520 Geography of Resource Use
- H524 Health Data Analysis
- H525 Intro Epidemiology
STATISTICS CORE COURSES

12 Credits for M.S., M.A. and Ph.D. degrees. These courses are to ensure that all students in the Quantitative Analysis track gain a basic familiarity with the theory of probability and statistics and the methodology of data analysis.

ST 521 Introduction to Mathematical Statistics
ST 511, 512 Methods of Data Analysis

QUANTITATIVE ANALYSIS COURSES

BI 570 Community Structure and Analysis
BEE 571 Biosystems Modeling Techniques
BEE 525 Stochastic Hydrology
CSS 590 Field-Plot Technique
FOR 525 Forest Modeling
FS 523 Natural Resource Data Analysis
GEO 541 Spatial Variation in Ecology and Earth Science
H 525 Principles of Epidemiology
H 526 Epidemiologic Methods
MTH 559 Topics in Mathematical Modeling
OC 682 Oceanographic and Atmospheric Data Analysis I
OC 683 Oceanographic and Atmospheric Data Analysis II
ST 513 Methods of Data Analysis
ST 515 Design and Analysis of Planned Experiments
ST 522 Introduction to Mathematical Statistics
ST 531 Sampling Methods
ST 535 Quantitative Ecology
ST 541 Probability, Computing and Simulation in Statistics
ST 543 Applied Stochastic Models
ST 571 Environmental Statistics
ST 573 Environmental Sampling
ST 557 Applied Multivariate Analysis
ST 565 Time Series Models
ST 623 Generalized Regression Models I

SCIENCE FOCAL AREA COURSES

6-9 Cr for M.S. and M.A. degree and 12-18 Cr for Ph.D. degree. These courses are intended to broaden the Program of Study by acquainting the student with subject matter in areas of environmental science to which quantitative analysis may be applied. The courses are to be selected from the Ecology Courses in the Area of Concentration in Ecology; the Basic Earth System Courses and Science Focal Area Courses in the Area of Concentration in Biogeochemistry; and the Social Science Environmental Topics in the Area of Concentration in Social Science. A single course may not be used to satisfy both the Science Focal Area requirement and the Quantitative Analysis requirement.
ELECTIVE COURSES

0 Credits for M.S. and M.A. degrees and 0-20 Credit for Ph.D. degree. Students will work with their graduate advisor and committee to select elective courses to develop necessary background and to add depth to the student's Program of Study.

THESIS:

The thesis requirement includes 6-9 Cr for a M.S. and M.A. degree and 36-56 Cr for a Ph.D. degree.