Environmental Information Systems

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The cross disciplinary minor in environmental information systems is designed for undergraduates interested in using computer and information management technology to solve environmental problems and improve environmental stewardship. Some examples of environmental information systems are database systems to track and report hazardous materials in factories, decision support systems to facilitate risk analysis and management, GIS-based natural resource inventory systems and automated business management systems to support and document environmental compliance.

The environmental information systems minor requires a minimum of 24 credit hours. Core courses are intended to ensure knowledge of the foundation disciplines. Electives should be chosen in consideration of the student’s particular interests within the general field of environmental information systems. At least one elective course must be outside of the student’s major. Students are advised to check prerequisites of listed courses.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>Core Courses</td>
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</tr>
<tr>
<td>CS 139. Algorithm Development 1</td>
<td>4</td>
</tr>
<tr>
<td>ISAT 340. Software Development 1</td>
<td>3</td>
</tr>
<tr>
<td>ISAT 320. Fundamentals of Environmental Science and Technology I</td>
<td>3</td>
</tr>
<tr>
<td>ISAT 321. Fundamentals of Environmental Science and Technology II</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 215. Geospatial Tools I – Cartography and GIS 1</td>
<td>3</td>
</tr>
<tr>
<td>Elective Courses</td>
<td></td>
</tr>
<tr>
<td>CIS/BSAN 314. Decision Support Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 239. Advanced Computer Programming 1</td>
<td>4</td>
</tr>
<tr>
<td>CS 474. Database Design and Application 1</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 216. Geospatial Tools II – Remote Sensing and GPS</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 465. GIS and Geographic Databases</td>
<td>3</td>
</tr>
<tr>
<td>ISAT 341. Modeling and Simulation</td>
<td>3</td>
</tr>
<tr>
<td>ISAT 420. Environmental Analysis and Modeling</td>
<td>3</td>
</tr>
<tr>
<td>ISAT 426. Environmental Information Systems</td>
<td>3</td>
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</tbody>
</table>

1 Dr equivalent by permission of director.

Note: ISAT 252 or CIS 221 substitute for CS 139; CIS 311 substitutes for CS 239; CS 474 substitutes for ISAT 340; ISAT 340 or COB 204 substitute for CS 274; CIS 330 substitutes for CS 474.

Concentration

Students are expected to be literate and competent in the sciences and mathematics underlying environmental problem solving. The environmental management minor requires a total of 29 credits, including prerequisite courses. The prerequisites must have been completed successfully before the student may be enrolled in the environmental management minor. Prerequisite courses may be fulfilled as part of the student’s major. At least one elective course must be outside of the student’s major.

Prerequisites

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>BIO 124. Ecology and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>Three hours from the following:</td>
<td></td>
</tr>
<tr>
<td>ISAT 251. Topics in Statistics for ISAT</td>
<td>3</td>
</tr>
<tr>
<td>MATH 220. Elementary Statistics</td>
<td></td>
</tr>
<tr>
<td>MATH 285. Data Analysis</td>
<td></td>
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<tr>
<td>MATH 318. Introduction to Probability and Statistics</td>
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Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>ISAT 320-321. Fundamentals of Environmental Science and Technology I-II</td>
<td>6</td>
</tr>
<tr>
<td>CHEM 241. Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>ISAT 302. Instrumentation and Measurement of the Environment</td>
<td>1</td>
</tr>
<tr>
<td>ENVT 400. Capstone Seminar</td>
<td>3</td>
</tr>
</tbody>
</table>

Concentration

Students completing the environmental management minor must concentrate in one of three areas: natural resources, industrial systems or environmental policy. Students should be aware that some of the listed courses may have additional prerequisites.

Natural Resources

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>ISAT 424. Natural Resource Management</td>
<td></td>
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</table>

Industrial Systems

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISAT 422. Environmental Management</td>
<td></td>
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Environmental Policy

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>ISAT 421. Environmental Policy and Regulation</td>
<td></td>
</tr>
<tr>
<td>ISAT 422. Environmental Management or ISAT 424. Natural Resource Management</td>
<td></td>
</tr>
</tbody>
</table>

HIST 427. US Environmental History
ISAT 411. Energy Economics and Policy

http://www.jmu.edu/catalog/14
The environmental science minor is a cross disciplinary program that can be elected by any student. Students pursuing programs ranging from the physical, natural or social sciences to education, journalism or business could benefit from this broadly-based environmental curriculum. The program draws from courses that focus on the application of scientific concepts and principles to the understanding of environmental problems and their solutions. The minor draws upon the expertise of faculty in the areas of biology, chemistry, geography, physics and integrated science and technology.

The environmental science minor:

- provides a scientific background to those students interested in environmental law, environmental economics and environmental sustainability.
- broadens the student's understanding of how sciences are linked to environmental questions.
- complements any major by focusing on courses related to environmental issues.

The minimum requirement for a minor in environmental science is 24 credit hours taken from the four groups outlined below. Students wishing to complete more than one of the environmental minors (environmental management, environmental science and environmental studies) may receive dual credit for the capstone course (ENVT 400), but may not receive dual credit for any other course that might be shared by the minors. Pre-approved study abroad and/or internship experiences may be substituted for courses that might be shared by the minors. Pre-approved study abroad and/or internship experiences may be substituted for one or more of the courses listed below.

No more than two courses from a single subject area can count toward the completion of the environmental science minor. A score of four or greater in AP Environmental Science substitutes toward the completion of the environmental science minor. A score of four or greater in AP Environmental Science substitutes toward the completion of the environmental science minor. Students must have completed 15 hours of their environment minor in order to enroll in the capstone.

Courses Credit Hours

Group 1. Introduction to Environmental Science 1 3-4

BIO 124. Ecology and Evolution

GEOG 102. Environment: Earth

GEOG 115. Earth Systems and Climate Change

GEOG 100. Environmental and Energy Sustainability

GEOG 112. Environmental Issues in Science and Technology

GEOG 210. Physical Geography

GEOG 110. Physical Geography

Group 2. Advanced Environmental Science courses 15

BIO 354. Global Climate and Life

BIO/GEOG 400. Geology and Ecology of the Bahamas

BIO/GEOG 402. Forest Ecology

BIO 452. Population Ecology

BIO 453. Microbial Ecology and Evolution

BIO 454. Introduction to Biometrics

BIO 456. Landscape Ecology

BIO 457. Biological Applications of GIS

BIO 459. Freshwater Ecology

BIO 465. Environmental Toxicology

BIO 466. Toxicology Seminar

CHEM 354. Environmental Chemistry Field Camp

CHEM 450. Nuclear and Radiation Chemistry

ENGR 411. Fundamentals of Sustainable Engineering and Design

ENGR 472. Biological Treatment Processes and Reactor Design

ENGR 474. Physical Chemical Treatment Processes

ENGR 478. Water Resources Engineering

ENVT 200. Environmental Systems Theory

GEOG 215. Geospatial Tools I – Cartography and GIS

GEOG 216. Geospatial Tools II – Remote Sensing and GPS

GEOG 290. Human Interaction with the Physical Environment

GEOG 340. Biogeography

GEOG 365. Cartography and Geospatial Visualization

GEOG 366. Introduction to GIS

GEOG 385. Principles of Remote Sensing

GEOG 211. Introduction to Oceanography

GEOG/GEOG 310. Environmental Impact

GEOL 320. Meteorology

GEOL 340. Environmental Soil Science

GEOL/Chem 355. Geochemistry of Natural Waters

GEOL 377. Earth Surface Processes

GEOL 406. Paleoclimatology and Paleooceanography

GEOL 410. Engineering Geology

GEOL 460. Hydrogeology

ISAT 311. Role of Energy in Modern Society

ISAT 320. Fundamentals of Environmental Science & Technology I

ISAT 321. Fundamentals of Environmental Science & Technology II

ISAT 420. Environmental Analysis and Modeling

ISAT 423. Environmental Remediation

ISAT 425. Environmental Hydrology

ISAT 427. Industrial Hygiene

ISAT 428. Industrial Ecology

MATH 321. Analysis of Variance and Experimental Design

MATH 322. Applied Linear Regression

MATH 324. Applied Nonparametric Statistics

MATH 328. Time Series Analysis

MATH/BIO 345E. Biometry

MATH 421. Applied Multivariate Statistics

PHYS 215. Energy and the Environment

No more than two courses from a single subject area can count toward the completion of the environmental science minor. A score of four or greater in AP Environmental Science substitutes toward the completion of the environmental science minor. Students must have completed 15 hours of their environment minor in order to enroll in the capstone.

Group 3. Environmental Studies courses 3

One of the following courses:

ANTH 373. Anthropological Perspectives on Environment

ECON 305. Environmental Economics

ECON 340. Economics of Natural Resources

ENG 371. Literature and the Environment

GEOG 325. Environmental Ethics

HIST 427. U.S. Environmental History

ISAT 311. Role of Energy in Modern Society

ISAT 421. Environmental Policy and Regulation

ISAT 473. Local Agriculture and Farm Internships

SCOM 354/WRTC 326. Environmental Communication and Advocacy

SOCI 311. Sociology of the Environment

WRTC 416/SOCIO 465. Rhetoric of Environmental Science and Technology

Group 4 – Capstone courses 3

ENVT 400. Capstone Seminar 2

1 Can be double-counted with General Education.

2 All students must complete the capstone course ENVT 400. Students must have completed 15 hours of their environment minor in order to enroll in the capstone.