## Environmental, Soil, and Water Science (ESWS)

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ESWS Coordinator  
115 Plant Science Building  
479-575-5740

Opportunities for employment and post-graduate study are numerous for graduates of the Department of Crop, Soil, and Environmental Sciences. Environmental, Soil, and Water Science graduates find jobs with environmental consulting companies, environmental education organizations, state agencies (e.g., Extension Service, Department of Environmental Quality, Health Department), federal agencies (e.g., Environmental Protection Agency, Natural Resources Conservation Service), municipalities and local environmental services (e.g., waste management and recycling, water and wastewater treatment facilities, parks and tourism departments), a wide variety of private businesses, and environmental research.

The Environmental, Soil, and Water Science major includes courses in areas such as environmental science, water quality, soil science, soil and water conservation, and the sustainable productivity of natural resources.

### Requirements for a Major in Environmental, Soil, and Water Science (ESWS)

State minimum core and discipline specific general education requirements:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>UNIV 1001</td>
<td>University Perspectives (Counts as General Elective)</td>
</tr>
</tbody>
</table>

**Communication**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>COMM 1313</td>
<td>Public Speaking (ACTS Equivalency = SPCH 1003)</td>
</tr>
<tr>
<td>CSES 3023</td>
<td>Crop, Soil, and Environmental Sciences Colloquium (or AGED 31 Communicating Agriculture to the Public)</td>
</tr>
</tbody>
</table>

**U.S. History and Government**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>Choose 3 hours U.S. History/Government from University Core</td>
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**Mathematics**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>MATH 1203</td>
<td>College Algebra (ACTS Equivalency = MATH 1103)</td>
</tr>
<tr>
<td>MATH 1213</td>
<td>Plane Trigonometry (ACTS Equivalency = MATH 1203) (Higher level MATH is encouraged for students with an ACT of 26 or higher and considering graduate school.)</td>
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**Sciences**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOL 1543</td>
<td>Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)</td>
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**ESWS Requirements**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOL 2013</td>
<td>General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)</td>
</tr>
<tr>
<td>BIOL 3863</td>
<td>General Ecology and General Ecology Laboratory or ENSC 322 Ecosystems Assessment and ENSC 322 Ecosystems Assessment Laboratory</td>
</tr>
<tr>
<td>CSES 1203</td>
<td>Introduction to Plant Sciences</td>
</tr>
<tr>
<td>CHEM 1103</td>
<td>University Chemistry I (ACTS Equivalency = CHEM 1101 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1101 Lab)</td>
</tr>
<tr>
<td>CHEM 1123</td>
<td>University Chemistry II (ACTS Equivalency = CHEM 1121 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1121 Lab)</td>
</tr>
<tr>
<td>CHEM 2613</td>
<td>Organic Physiological Chemistry (ACTS Equivalency = CHEM 1222 Lecture) and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1222 Lab) or CHEM 360 Organic Chemistry I and CHEM 360 Organic Chemistry I Laboratory</td>
</tr>
<tr>
<td>GEOS 1113</td>
<td>General Geology (ACTS Equivalency = GEOL 1114 Lecture) and General Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab)</td>
</tr>
<tr>
<td>PHYS 2013</td>
<td>College Physics I (ACTS Equivalency = PHYS 2014 Lecture) and College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)</td>
</tr>
</tbody>
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**Fine Arts and Humanities**

Select 3 hours Fine Arts from University Core

Select 3 hours Humanities from University Core

**Social Sciences**

Select 9 hours Social Sciences from University Core

**ESWS Requirements**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CSES 2203</td>
<td>Soil Science</td>
</tr>
<tr>
<td>CSES 2201L</td>
<td>Soil Science Laboratory</td>
</tr>
<tr>
<td>ENSC 1003</td>
<td>Environmental Science</td>
</tr>
<tr>
<td>ENSC 1001L</td>
<td>Environmental Science Laboratory</td>
</tr>
<tr>
<td>AGME 2903</td>
<td>Agricultural and Human Environmental Sciences Applications of Microcomputers</td>
</tr>
<tr>
<td>ENSC 3003</td>
<td>Introduction to Water Science</td>
</tr>
<tr>
<td>STAT 2303</td>
<td>Principles of Statistics (ACTS Equivalency = MATH 2103) or AGST 402 Principles of Experimentation</td>
</tr>
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</table>

**Soil Science Core**

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>CSES 3214</td>
<td>Soil Resources and Nutrient Cycles (with Lab Component)</td>
</tr>
<tr>
<td>CSES 4224</td>
<td>Soil Fertility (with Lab Component)</td>
</tr>
<tr>
<td>CSES 4253</td>
<td>Soil Classification and Genesis (with Lab Component)</td>
</tr>
<tr>
<td>CSES 4553</td>
<td>Wetland Soils</td>
</tr>
</tbody>
</table>
**Environmental, Soil, and Water Science (ESWS)**

### Water Science Core

Select one of the following: 3

- ENSC 4023: Water Quality
- GEOS 3333: Oceanography
- GEOS 4033: Hydrogeology
- GEOS 4363: Climatology
- GEOS 4473: Applied Climatology

### Natural Resources Core

Select 9 hours from the following two groups: 9

**Environmental Science**
- AGME 3153: Surveying in Agriculture and Forestry
- CSES 2013: Pest Management
- CSES 355V: Soil Profile Description (1 hour, may take twice)
- CSES 462V: Internship (1-6 credit hours)
- CSES 4553: Wetland Soils
- ENSC 3103: Plants and Environmental Restoration
- ENSC 3263: Soil and Water Conservation
- ENSC 3603: GIS for Environmental Science
- ENSC 4021L: Water Quality Laboratory
- ENSC 4034: Analysis of Environmental Contaminants
- ENSC 4401: Professional Certification Preparation
- GEOS 3043: Sustaining Earth
- GEOS 3543: Geospatial Applications and Information Science

**Environmental Studies (0-3 hours)**
- AGEC 3413: Principles of Environmental Economics
- AGEC 3503: Agricultural Law I
- AGEC 3523: Environmental and Natural Resources Law
- ENSC 3933: Environmental Ethics
- SOCI 4603: Environmental Sociology

### General Electives

- Courses within major cannot be taken for duplicate credit.
- **One 3-hr study abroad course, either Experiential Learning in Indian Agriculture (Jan) or Sustainability in the Eurozone Agro-Food Chain (May), which are both taken under AFLS 401V/401VH, can be substituted for 3 hours of Natural Resources core.**

## Environmental, Soil, and Water Science B.S.A.

### Eight-Semester Degree Program

Students wishing to follow the degree plan should see the Eight-Semester Degree Policy (http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/) for university requirements of the program.

### First Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013)</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 1003 Environmental Science</td>
<td>4</td>
</tr>
<tr>
<td>&amp; ENSC 1001L Environmental Science Laboratory</td>
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</table>

### Second Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>General Elective as Broadening Elective (could apply toward a minor)</td>
<td>3</td>
</tr>
<tr>
<td>GEOS 1113 General Geology (ACTS Equivalency = GEOL 1114 Lecture)</td>
<td>4</td>
</tr>
<tr>
<td>&amp; GEOS 1111L General Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab)</td>
<td></td>
</tr>
<tr>
<td>History University Core Elective</td>
<td>3</td>
</tr>
<tr>
<td>COMM 1313 Public Speaking (ACTS Equivalency = SPCH 1003)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1213 Plane Trigonometry (ACTS Equivalency = MATH 1203)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1123 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture)</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 1121L University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)</td>
<td></td>
</tr>
<tr>
<td>Fine Arts/Humanities University Core Elective</td>
<td>3</td>
</tr>
<tr>
<td>Social Sciences University Core Elective</td>
<td>3</td>
</tr>
<tr>
<td>AGME 2903 Agricultural and Human Environmental Sciences Applications of Microcomputers</td>
<td>3</td>
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Year Total: 16-17

### Third Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>CSES 2203 Soil Science &amp; CSES 2201L Soil Science Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 2013 College Physics I (ACTS Equivalency = PHYS 2014 Lecture)</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHYS 2011L College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)</td>
<td></td>
</tr>
<tr>
<td>Water Science or Natural Resources Core</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>General Electives as AFLS Broadening Electives (Could apply toward a minor)</td>
<td></td>
</tr>
</tbody>
</table>
Environmental, Soil, and Water Science (ESWS)

CHEM 3603 Organic Chemistry I & CHEM 3601L Organic Chemistry I Laboratory

Biol 2013 General Microbiology (ACTS Equivalency = BIOL 2004 Lecture)
& BIOL 2011L General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)
CHEM 2613 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture)
& CHEM 2611L Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)

Social Sciences Core Elective 3

Water Science or Soil Science Core (For Water Science: Recommended: ENSC 3003; Soil Science: Pre-at least CSES 2203)

Year Total: 14 14

Fourth Year

Select one of the following:

CSES 3023 Crop, Soil, and Environmental Sciences Colloquium 3
AGED 3143 Communicating Agriculture to the Public

Select one of the following:

ENSC 3223 Ecosystems Assessment & ENSC 3221L Ecosystems Assessment Laboratory 4
Biol 3863 General Ecology & BIOL 3861L General Ecology Laboratory

Statistics or Natural Resources Core 3
Soil Science or Natural Resources Core 3-4
Natural Resources Core or General Elective (Could apply elective toward a minor) 3
Natural Resources Core or General Elective 3
Statistics or Natural Resources Core 3

General Elective 3
General Elective as Broadening Elective (Could apply toward a minor) 2-3
General Elective (May wish to take another elective. Could apply toward a minor) 2-3

Year Total: 16 13

Total Units in Sequence: 120

Minor in Natural Resources Management (NRMT-M)

A student planning to minor in Natural Resources Management must notify the program adviser for consultation and more detailed information.

No more than 9 hours can be counted towards a Natural Resources Management minor with an ESWS major. The Natural Resources Management Minor consists of 18 hours to include the following:

Required courses 7
ENSC 1003 Environmental Science
ENSC 1001L Environmental Science Laboratory
CSES 2203 Soil Science

Optional courses (11 hours, at least 8 hours must be 3000-level or above) 11
AGEC 3413 Principles of Environmental Economics
AGEC 3503 Agricultural Law I
AGEC 3523 Environmental and Natural Resources Law
Biol 3863 General Ecology
& BIOL 3861L and General Ecology Laboratory
CSES 1203 Introduction to Plant Sciences
CSES 2013 Pest Management
CSES 2201L Soil Science Laboratory
CSES 3214 Soil Resources and Nutrient Cycles
CSES 355V Soil Profile Description
CSES 4013 Advanced Crop Science
CSES 4133 Ecology and Morphology of Weedy and Invasive Plants
CSES 4224 Soil Fertility
CSES 4253 Soil Classification and Genesis
CSES 4553 Wetland Soils
CSES 462V Internship
ENSC 3103 Plants and Environmental Restoration
ENSC 3223 Ecosystems Assessment & ENSC 3221L and Ecosystems Assessment Laboratory
ENSC 3263 Soil and Water Conservation
ENSC 3603 GIS for Environmental Science
ENSC 4021L Water Quality Laboratory
ENSC 4023 Water Quality
ENSC 4034 Analysis of Environmental Contaminants
ENSC 4263 Environmental Soil Science
ENSC 4401 Professional Certification Preparation
GEOS 3043 Sustaining Earth
GEOS 3543 Geospatial Applications and Information Science

Total Hours 18

Minor in Soil Science (SOIL-M)

A student planning to minor in Soil Science must notify the program adviser for consultation and more detailed information.

The Soil Science minor will consist of a total of 18 hours comprising the following required and elective courses. No more than 9 hours can be counted towards a Soil Science minor with an Environmental Soil and Water Science major. Those students interested in obtaining certification in the area of soil science will need at least 15 soil science hours, preferably covering each of the sub-disciplines (i.e., fertility, genesis, morphology, and classification, chemistry, physics, soil biology and ecology, and land use and management).

Required Courses 4
CSES 2203 Soil Science & CSES 2201L and Soil Science Laboratory

Elective Courses 14
Select the remaining 14 hours from the following courses:
Undergraduate Courses
CSES 3214 Soil Resources and Nutrient Cycles
### Crop, Soil and Environmental Sciences Courses

**CSES 1011. Introduction to Crop, Soil, and Environmental Science. 1 Hour.**
An introduction to the CSES department and majors in Environmental Soil and Water Sciences and Crop Management. Emphasis will be placed on issues and opportunities within these disciplines and orienting students to the department and University of Arkansas. Required of all department majors with less than 24 semester credit hours. Recitation 1 hour 20 minutes per week for the first eight weeks of the semester. Prerequisite: Freshman and sophomore standing only. (Typically offered: Irregular)

**CSES 1203. Introduction to Plant Sciences. 3 Hours.**
An introduction to basics of agricultural crop plant structure, growth, and production. (Typically offered: Fall and Spring)

**CSES 2003. Introduction to Weed Science. 3 Hours.**
Fundamental, practical concepts of weed control and weed biology; equipment and techniques used in modern weed control practices; and basic recommendations and systems for specific agronomic and horticultural crops. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CSES 1203 or CSES 2103 or HORT 2003. (Typically offered: Irregular)

**CSES 2012. Introduction to Organic Crop Production. 2 Hours.**
An introduction to the principles of organic agriculture and ecology and the regulations defining organic production and certification. Additional topics include crop rotations for pest management and for increasing soil organic matter, feeding the soil and plant nutrition, soil health, and green manuring, corporate agriculture and genetically modified organisms. (Typically offered: Irregular)

**CSES 2013. Pest Management. 3 Hours.**
Introduction to basic principles of pest management as they relate to vertebrate animals, insects, plant disease and weeds. Selected pests are studied with emphasis on current management approaches and alternative pest control. (Typically offered: Spring)

**CSES 2101L. Crop Science Laboratory. 1 Hour.**
A series of laboratory experiments designed to reinforce principles of plant growth and development, reproduction, classification, and the utilization of plant products. Emphasis is placed on major crop plant species. Experiments are conducted by individuals or by teams. Laboratory consists of a single, 2-hour period each week. Required for Crop Management majors. Corequisite: CSES 2103. (Typically offered: Spring)

**CSES 2103. Crop Science. 3 Hours.**
Principles of crop growth, development, and utilization and how these principles relate to production. Emphasis on major agronomic crop species. Lecture 3 hours per week. (Typically offered: Spring)

**CSES 2201L. Soil Science Laboratory. 1 Hour.**
Field and laboratory exercises related to the study of the physical, chemical, and biological properties of soils. Laboratory mandatory for all crop management and environmental, soil, and water science majors and optional for others. Laboratory 2 hours per week. Pre- or Corequisite: CSES 2203. (Typically offered: Fall and Spring)

**CSES 2203. Soil Science. 3 Hours.**
Origin, classification, and physical, chemical, and biological properties of soils. Lecture 3 hours, discussion 1 hour per week. Corequisite: Drill component. Prerequisite: MATH 1203 and CHEM 1103 or CHEM 1073. (Typically offered: Fall and Spring)

**CSES 3023. Crop, Soil, and Environmental Sciences Colloquium. 3 Hours.**
A communication-intensive course covering topics in agronomy and environmental, soil, and water science with particular emphasis on spoken communication but also including written communication, group activities, professionalism, ethics, problem solving, and information retrieval. A student-oriented class with collaborative participation. Colloquium workshop: 3 hours per week. Prerequisite: COMM 1313 and Junior or Senior standing only. (Typically offered: Fall)

**CSES 3112. Forage Management. 2 Hours.**
Forage crops for pasture, hay, and silage with reference to growth and development, production, nutritional quality, and grazing systems. Lecture 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Irregular)

**CSES 3214. Soil Resources and Nutrient Cycles. 4 Hours.**
Integration of the fundamental concepts of the biological, chemical, and physical properties of soil systems and their roles in managing soil resources. Lecture 3 hours, laboratory 3 hours per week. Pre- or Corequisite: BIOL 2013 and BIOL 2011L. Corequisite: Lab component. Prerequisite: CSES 2203. (Typically offered: Spring Odd Years)

**CSES 3312. Cotton Production. 2 Hours.**
Principles and techniques associated with production of cotton. Recitation 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Fall Even Years)

**CSES 3322. Soybean Production. 2 Hours.**
An overview of the history and utilization of soybean as well as the physiological and environmental basis for the development of economical soybean production practices. Recitation 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Spring Odd Years)

**CSES 3332. Rice Production. 2 Hours.**
A study of the principles and practices involved in rice culture worldwide with major emphasis on the United States. Recitation 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Fall Odd Years)

**CSES 3342. Cereal Grain Production. 2 Hours.**
An overview of the botany, production, cultural practices, soil & climatic adaptation and utilization of the major cereal grain crops. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Spring Even Years)

**CSES 335V. Soil Profile Description. 1-2 Hour.**
Training for soil profile description writing and membership of judging teams. (Typically offered: Fall) May be repeated for up to 8 hours of degree credit.
CSES 3603. Metrics for Sustainable Agricultural Systems. 3 Hours.
Analysis of productive agricultural systems necessary to meet expanding demand worldwide for food, feed, fiber and fuel while preserving critical ecosystem services to avoid future catastrophic failures of the biosphere. Characterization of sustainable systems using well-defined metrics, indicators and indices, including reference to sustainability certifications. Metrics for soil, water, atmosphere and biodiversity. Applications in crop and animal production with scales from field to watershed to eco-region. Examining the process and methodologies of integrating metrics into indices to support sustainable supply chain decisions. Discussion of life cycle analyses and current initiatives toward approaching agricultural systems sustainability. Technical course intended for students in agriculture, biology, business, engineering, and environmental sciences. (Typically offered: Fall)
This course is cross-listed with BENG 3603.

CSES 400V. Special Problems. 1-6 Hour.
Work on special problems in crop, soil and environmental sciences or related field. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

CSES 4013. Advanced Crop Science. 3 Hours.
Fundamental concepts of crop physiology, crop improvement, seed science, and crop production systems. Recitation 3 hours per week. Prerequisite: CSES 2103 and CSES 2203. (Typically offered: Spring)

CSES 402V. Special Topics. 1-3 Hour.
Studies of selected topics in crop, soil and environmental sciences not available in other courses. (Typically offered: Irregular) May be repeated for up to 12 hours of degree credit.

CSES 4103. Plant Breeding. 3 Hours.
Basic principles involved in plant breeding programs to improve crop plants and seed programs. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: ANSC 3123 or BIOL 2233. (Typically offered: Fall Even Years)

CSES 4133. Ecology and Morphology of Weedy and Invasive Plants. 3 Hours.
Study of weeds as economic pests occurring in both agricultural and nonagricultural situations and including poisonous plants and other specific weed problems. Gross morphological plant family characteristics which aid identification, habitat of growth and distribution, ecology, competition, and allelopathy are discussed. Lecture 2 hours, laboratory 2 hours a week. Corequisite: Lab component. Prerequisite: CSES 2103 or HORT 2003. (Typically offered: Fall)

CSES 4143. Principles of Weed Control. 3 Hours.
Advanced concepts and technology used in modern weed control practices and study of the chemistry and specific activity of herbicides in current usage. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CHEM 1073 and CHEM 1071L. (Typically offered: Spring)

CSES 4224. Soil Fertility. 4 Hours.
Study of the soil's chemical, biological and physical properties, and human modification of these properties, as they influence the uptake and utilization of the essential nutrients by plants. Lecture 3 hours, laboratory 2 hours per week. Prerequisite: CHEM 1123 and CHEM 1121L or (CHEM 1073 and CHEM 1071L and CHEM 2613 and CHEM 2611L). Corequisite: Lab component. Prerequisite: CSES 2201L and CSES 2203. (Typically offered: Fall)

CSES 4253. Soil Classification and Genesis. 3 Hours.
Lecture and field evaluation of soil properties and their relation to soil genesis and soil classification with emphasis on soils of Arkansas. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CSES 2203 and CSES 2201L. (Typically offered: Fall Odd Years)

CSES 4303. Bioenergy Feedstock Production. 3 Hours.
Overview of production and characteristics of cultivated crops, perennial grasses, and woody species as feedstocks for bioenergy. Fundamentals of plant growth factors, culture, harvest and storage, quality and improvement, and introduction to environmental impact, modeling, and resource utilization. Prerequisite: MATH 1203 and BIOL 1543 or CSES 1203. Courses in introductory chemistry or soil science are preferred. (Typically offered: Spring)

CSES 4553. Wetland Soils. 3 Hours.
This course explains the chemical, physical, and morphological characteristics of wetland soils and describes the techniques for identifying wetland soils using field indicators and monitoring equipment. This course also explains principles of wetland creation, restoration, and mitigation - all key components in assuring the sustainability of valuable wetland resources. Prerequisite: CSES 2203 and CSES 2201L or CSES 355V. (Typically offered: Spring Odd Years)

CSES 462V. Internship. 1-6 Hour.
Supervised practical work experience in agronomy and environmental science to develop and demonstrate professional competence. Faculty approval of project proposal prior to enrollment and written and oral reports after the project is complete are required. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

Environmental Science Courses

ENSC 1001L. Environmental Science Laboratory. 1 Hour.
Laboratory, field trip, and discussion sessions covering the concepts and information allowing students to critically evaluate environmental issues. Topics will include: laboratory safety, recycling, composting, geographic information systems, soil testing, water quality, hazardous wastes, waste disposal, wetlands, wastewater treatment, and sustainable food systems. Laboratory 2 hours/week. Corequisite: ENSC 1003. (Typically offered: Fall and Spring)
This course is cross-listed with BIOL 1001L.

ENSC 1001M. Honors Environmental Science Laboratory. 1 Hour.
Laboratory, field trip, and discussion sessions covering the concepts and information allowing students to critically evaluate environmental issues. Topics will include: laboratory safety, recycling, composting, geographic information systems, soil testing, water quality, hazardous wastes, waste disposal, wetlands, wastewater treatment, and sustainable food systems. Laboratory 2 hours/week. Corequisite: ENSC 1003. (Typically offered: Fall and Spring)
This course is cross-listed with ENSC 1001L, BIOL 1001L.

ENSC 1003. Environmental Science. 3 Hours.
Series of lectures and discussions introducing the topic of environmental science including factors related to water, soil, and air quality. Corequisite: ENSC 1001L. (Typically offered: Fall and Spring)
This course is cross-listed with BIOL 1003.

ENSC 1003H. Honors Environmental Science. 3 Hours.
Series of lectures and discussions introducing the topic of environmental science including factors related to water, soil, and air quality. If taking course for University core Natural Science credit, ENSC 1001L is a co-requisite. Corequisite: ENSC 1001L. (Typically offered: Fall and Spring)
This course is cross-listed with ENSC 1003, BIOL 1003.

ENSC 1833. Soils and Civilization. 3 Hours.
Humankind's use of and dependence on soil from the Neolithic Revolution to the present day. The composition and basic properties of soils. The importance of soils as components of ecosystems, and ecosystem services provided by soils. The nature and causes of soil degradation. The need for conservation of soils. Soil as a key factor in sustaining life on Earth. (Typically offered: Spring)
ENSC 3003. Introduction to Water Science. 3 Hours.
Properties, occurrence, and description of the types, functions, quality and quantity, potential contaminants, uses, and guiding policies and regulations used in the various water resources in the environment. Prerequisite: (ENSC 1003 OR CHEM 1053 (or higher) OR GEOS 1113 (or higher) OR BIOL 1543). (Typically offered: Spring)

ENSC 3103. Plants and Environmental Restoration. 3 Hours.
Selection, establishment, and use of plants to promote soil stabilization, water quality, and wildlife habitat. Principles and practices of managing plants for soil remediation, nutrient and sediment trapping, and restoration of plant communities. Prerequisite: CSES 1203 or HORT 2003 or BIOL 1613. (Typically offered: Fall Even Years)

ENSC 3103H. Honors Plants and Environmental Restoration. 3 Hours.
Selection, establishment, and use of plants to promote soil stabilization, water quality, and wildlife habitat. Principles and practices of managing plants for soil remediation, nutrient and sediment trapping, and restoration of plant communities. Prerequisite: CSES 1203 or HORT 2003 or BIOL 1613 and honors standing. (Typically offered: Fall)

This course is equivalent to ENSC 3103.

ENSC 3221L. Ecosystems Assessment Laboratory. 1 Hour.
The purpose of this laboratory is to complement concepts learned in lecture by carrying out experiments that familiarize students with methods used in soil and aquatic ecology. Students will collect samples, analyze and interpret data obtained from soil and water samples. Lab will meet once per week for 3 hours. Corequisite: ENSC 3223. (Typically offered: Fall Even Years)

ENSC 3223. Ecosystems Assessment. 3 Hours.
Application of basic ecological principles to gain an appreciation for ecosystem assessment and management. Lecture 3 hours per week. Prerequisite: BIOL 1543. (Typically offered: Fall Even Years)

ENSC 3263. Soil and Water Conservation. 3 Hours.
Effect of land use on water quality. Major sources of agricultural nonpoint pollutants. Best management practices used to minimize water quality impacts. Prerequisite: CSES 2203. (Typically offered: Fall)

ENSC 3413. Principles of Environmental Economics. 3 Hours.
An introductory, issues-oriented course in the economics of the environment. What is involved in society making decisions about environmental quality will be studied. Environmental issues important to the State of Arkansas and the United States will be emphasized. Prerequisite: AGEC 1103 or ECON 2023. (Typically offered: Spring)
This course is cross-listed with AGEC 3413.

ENSC 3603. GIS for Environmental Science. 3 Hours.
Provide instruction on the uses of GIS techniques in solving practical environmental and agricultural land use problems. Areas include: 1) an introduction to spatial variability in soils with an emphasis on the application of GIS techniques to map and understand spatial parameters important to different land uses, and 2) development of individual experience in the use of GIS in solving environmental and agricultural problems using an oral and written term project. Prerequisite: CSES 2203. (Typically offered: Spring Odd Years)

ENSC 3933. Environmental Ethics. 3 Hours.
The course addresses ethical questions about nature and the natural environment. Topics of discussion include anthropocentric and biocentric ethics, population control, obligations to future generations, animal rights, moral considerability, Leopold's land ethic, deep ecology, and ecofeminism. Lecture/discussions 3 hours per week. Prerequisite: ENSC 1003 or PHIL 2003 or PHIL 2103. (Typically offered: Spring)
This course is cross-listed with PHIL 3113.

ENSC 400V. Special Problems. 1-3 Hour.
Work on special problems in environmental science or related fields. (Typically offered: Irregular) May be repeated for up to 8 hours of degree credit.

ENSC 4021L. Water Quality Laboratory. 1 Hour.
Field and laboratory experience in physical, chemical, and biological characteristics of natural waters (rain, river, lake, soil, ground, etc.). Laboratory experiments in water sampling, measurement of water quality parameters such as pH, alkalinity and acidity, redox, hardness, BOD, TSS, etc., and instrumentation. Prerequisite or Corequisite: ENSC 4023 (Typically offered: Fall)

ENSC 4023. Water Quality. 3 Hours.
Physical, chemical, and biological characteristics of natural waters (rain, river, lake, soil, ground, etc.). Discussion of water quality parameters such as pH, alkalinity and acidity, redox, hardness, BOD, TSS, etc. Aquatic processes of pollutants and principles of modeling. Prerequisite: CHEM 1123 and CHEM 1121L and BIOL 1543 and BIOL 1541L. (Typically offered: Fall)

ENSC 4034. Analysis of Environmental Contaminants. 4 Hours.
Methods of analysis for inorganic and organic contaminants, radionuclides and microorganisms in soil and water. Quality assurance and quality control, sampling protocols, sample handling, instrumentation and data analysis. Lecture 2 hours and laboratory 4 hours per week. Corequisite: Lab component. Pre- or Corequisite: CHEM 2613 and CHEM 2611L or CHEM 3603 and CHEM 3601L. (Typically offered: Spring Even Years)

ENSC 404V. Special Topics. 1-3 Hour.
Studies of selected topics in environmental sciences not available in other courses. (Typically offered: Irregular) May be repeated for up to 12 hours of degree credit.

ENSC 4263. Environmental Soil Science. 3 Hours.
Study of the behavior of pesticides, toxic organic compounds, metals, nutrients, and pathogenic microorganisms in the soil/plant/water continuum. Lecture 3 hours per week. Pre- or Corequisite: PHYS 2013 and PHYS 2011L. Prerequisite: CSES 3214. (Typically offered: Spring Even Years)

ENSC 4401. Professional Certification Preparation. 1 Hour.
This class is meant to reinforce concepts and skills already learned in other soil and environmental science and related courses and to provide the opportunity to prepare to take a national certification examination. If so chosen, students may pursue certification as soil or environmental science professionals. Prerequisite: Senior standing. (Typically offered: Spring)