

# Environmental, Soil, and Water Science (ESWS)

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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 (<http://catalog.uark.edu/undergraduatecatalog/gened/stateminimum/>) and discipline specific general education (<http://catalog.uark.edu/undergraduatecatalog/gened/generaleducation/>) requirements:

(Course work that meets state minimum core requirements is in bold.)

<b>University Requirements</b>	<b>1</b>
UNIV 1001 University Perspectives (Counts as General Elective)	
<b>Communication</b>	<b>12</b>
<b>Choose from English Core course (6 hours)</b>	
COMM 1313 Public Speaking (ACTS Equivalency = SPCH 1003)	
CSES 3023 Crop, Soil, and Environmental Sciences Colloquium or ACOM 31 Communicating Agriculture to the Public	
<b>U.S. History and Government</b>	<b>3</b>
<b>Choose 3 hours U.S. History/Government from state minimum core</b>	
<b>Mathematics</b>	<b>6</b>
<b>MATH 1203 College Algebra (ACTS Equivalency = MATH 1103)</b>	
MATH 1213 Plane Trigonometry (ACTS Equivalency = MATH 1203) (Higher level MATH is encouraged for students with an ACT of 26 or higher and considering graduate school.)	
<b>Sciences</b>	<b>35</b>

**BIOL 1543 Principles of Biology (ACTS Equivalency = & BIOL 1541L BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)**

BIOL 2013 General Microbiology (ACTS Equivalency = BIOL & BIOL 2011L 2004 Lecture)  
and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)

BIOL 3863 General Ecology  
& BIOL 3861L and General Ecology Laboratory  
or ENSC 3223 Ecosystems Assessment  
& ENSC 3224 Lab Ecosystems Assessment Laboratory

**CSES 1203 Introduction to Plant Sciences**

**CHEM 1103 University Chemistry I (ACTS Equivalency = & CHEM 1101L CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)**

**CHEM 1123 University Chemistry II (ACTS Equivalency = & CHEM 1121L CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)**

CHEM 2613 Organic Physiological Chemistry (ACTS & CHEM 2611L Equivalency = CHEM 1224 Lecture)  
and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)

or CHEM 3603 Organic Chemistry I  
& CHEM 3604 Lab Organic Chemistry I Laboratory

**GEOS 1113 Physical Geology (ACTS Equivalency = GEOL & GEOS 1111L 1114 Lecture) and Physical Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab)**

**PHYS 2013 College Physics I (ACTS Equivalency = PHYS & PHYS 2011L 2014 Lecture) and College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)**

**Fine Arts and Humanities 6**

**Select 3 hours Fine Arts from state minimum core**

**Select 3 hours Humanities from state minimum core**

**Social Sciences 9**

**Select 9 hours Social Sciences from state minimum core**

**ESWS Requirements\***

**Environmental Science Core 17**

CSES 2203 Soil Science

CSES 2201L Soil Science Laboratory

ENSC 1003 Environmental Science

ENSC 1001L Environmental Science Laboratory

ASTM 2903 Agricultural and Human Environmental Sciences Applications of Microcomputers

ENSC 3003 Introduction to Water Science

STAT 2303 Principles of Statistics (ACTS Equivalency = MATH 2103)

**Soil Science Core**

Select one of the following: 3-4

CSES 3214 Soil Resources and Nutrient Cycles (with Lab Component)

CSES 4224 Soil Fertility (with Lab Component)

CSES 4253	Soil Classification and Genesis (with Lab Component)
CSES 4553	Wetland Soils
ENSC 3263	Soil and Water Conservation
ENSC 4263	Environmental Soil Science (with Lab Component)

**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\*\***

ASTM 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	

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 16-17

**Total Hours 120**

\*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/undergradcatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) for university requirements of the program.

	Units	
	Fall	Spring
ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)	3	

Satisfies General Education Outcomes 3.4 and 5.1:		
ENSC 1003 Environmental Science & ENSC 1001L Environmental Science Laboratory	4	
Satisfies General Education Outcome 3.4:		
BIOL 1543 Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) & BIOL 1541L Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	4	
MATH 1203 College Algebra (ACTS Equivalency = MATH 1103) (Satisfies General Education Outcome 2.1)	3	
UNIV 1001 University Perspectives	1	
Fine Arts or Humanities State Minimum Core Elective (Satisfies General Education Outcome 3.1 or 3.2) <sup>1, 2</sup>		3
ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.1)		3
CSES 1203 Introduction to Plant Sciences		3
Social Sciences State Minimum Core Elective (Satisfies General Education Outcome 3.3)		3
CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 1101L University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)		4
<b>Year Total:</b>	<b>15</b>	<b>16</b>

**Second Year**

	Units	
	Fall	Spring

General Elective as Broadening Elective (could apply toward a minor)	3	
GEOS 1113 Physical Geology (ACTS Equivalency = GEOL 1114 Lecture) & GEOS 1111L Physical Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab)	4	
U.S. History or Government State Minimum Core Elective (Satisfies General Education Outcome 4.2)	3	
COMM 1313 Public Speaking (ACTS Equivalency = SPCH 1003) (Satisfies General Education Outcomes 1.2 and 5.1)	3	
MATH 1213 Plane Trigonometry (ACTS Equivalency = MATH 1203)	3	
CHEM 1123 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 1121L University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)		4
Fine Arts or Humanities State Minimum Core Elective (Satisfies General Education Outcome 3.1 or 3.2) <sup>1, 2</sup>		3
Social Sciences State Minimum Core Elective (Satisfies General Education Outcome 3.3)		3
ENSC 3003 Introduction to Water Science		3
ASTM 2903 Agricultural and Human Environmental Sciences Applications of Microcomputers		3
<b>Year Total:</b>	<b>16</b>	<b>16</b>

Third Year	Units	
	Fall	Spring
CSES 2203 Soil Science & CSES 2201L Soil Science Laboratory	4	
PHYS 2013 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 2011L College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)	4	
Water Science or Natural Resources Core	3	
Select one of the following:	3-4	
General Electives as AFLS Broadening Electives (Could apply toward a minor) <sup>4</sup>		
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)	4	
CHEM 2613 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) & CHEM 2611L Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)	4	
Social Sciences State Minimum Core Elective (Satisfies General Education Outcomes 3.3 and 4.1) <sup>3</sup>	3	
Water Science or Soil Science Core (For Water Science: Recommended: ENSC 3003; Soil Science: Pre-at least CSES 2203)	3-4	
Year Total:	14	14

Fourth Year	Units	
	Fall	Spring
Select one of the following:	3	
CSES 3023 Crop, Soil, and Environmental Sciences Colloquium (Satisfies General Education Outcome 6.1)		
ACOM 3143 Communicating Agriculture to the Public		
Select one of the following:	4	
ENSC 3223 Ecosystems Assessment & ENSC 3221L Ecosystems Assessment Laboratory		
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) <sup>4</sup>	3	
Natural Resources Core or General Elective <sup>4</sup>		3
Statistics or Natural Resources Core		3
General Elective <sup>4</sup>		3
General Elective as Broadening Elective (Could apply toward a minor) <sup>4</sup>		2-3
General Elective (May wish to take another elective. Could apply toward a minor) <sup>4</sup>		2-3
Year Total:	16	13

Total Units in Sequence:	120
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- <sup>1</sup> The Fine Arts Elective courses which satisfy General Education Outcome 3.1 include: ARCH 1003, ARHS 1003, COMM 1003, DANC 1003, LARC 1003, MLIT 1003, MLIT 1003H, MLIT 1013, MLIT 1013H, MLIT 1333, THTR 1003, THTR 1013, or THTR 1013H.
- <sup>2</sup> The Humanities Elective courses which satisfy General Education Outcome 3.2 include: AAST 2023, ANTH 1033, ARCH 1013, CLST 1003, CLST 1003H, CLST 1013, COMM 1233, DANC 1003, ENGL 1213, GNST 2003, HIST 1113, HIST 1113H, HIST 1123, HIST 1123H, HIST 2003, HIST 2013, HUMN 1124H, HUMN 2213, LALS 2013, MRST 2013, MUSY 2003, MUSY 2003H, PHIL 2003, PHIL 2003C, PHIL 2003H, PHIL 2103, PHIL 2103C, PHIL 2303, THTR 1003, THTR 1013, THTR 1013H, WLIT 1113, WLIT 1123, or intermediate-level world language (usually 2003-level).
- <sup>3</sup> The Social Science Elective courses which satisfy General Education Outcomes 3.3 and 4.1 include: ANTH 1023, COMM 1023, HDFS 1403, HDFS 2413, HIST 1113, HIST 1113H, HIST 1123, HIST 1123H, HIST 2093, HUMN 1114H, HUMN 2114H, INST 2813, INST 2813H, PLSC 2013, PLSC 2813, PLSC 2813H, RESM 2853, SOCI 2013, SOCI 2013H, or SOCI 2033.
- <sup>4</sup> Students must complete 40 hours of upper division courses (3000-4000 level). It is recommended that students consult with their academic adviser when making course selections.

## 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 or ENSC 30(Introduction to Water 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 & BIOL 3861L	General Ecology 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 & ENSC 3221L	Ecosystems Assessment and Ecosystems Assessment Laboratory	
ENSC 3263	Soil and Water Conservation	
ENSC 3603 ENSC 4021L	GIS for Environmental Science	
ENSC 4023	Water Quality	
ENSC 4263	Environmental Soil Science	
ENSC 4401	Professional Certification Preparation	
GEOS 3043	Sustaining Earth	
GEOS 3543	Geospatial Applications and Information Science	
<b>Total Hours</b>		<b>18</b>

## 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

CSES 2203 & CSES 2201L	Soil Science and Soil Science Laboratory	4
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### Elective Courses 14

Select the remaining 14 hours from the following courses:

#### Undergraduate Courses

CSES 3214	Soil Resources and Nutrient Cycles	
CSES 355V	Soil Profile Description (1 hour; may be taken for up to 2 hours credit)	
CSES 4224	Soil Fertility	
CSES 4253	Soil Classification and Genesis	
CSES 4553	Wetland Soils	
ENSC 3263	Soil and Water Conservation	
ENSC 4263	Environmental Soil Science	
ENSC 4401	Professional Certification Preparation (soils exam)	

#### Graduate Courses

CSES 5033	Advanced Soil Fertility and Plant Nutrition	
CSES 5224	Soil Physics	
CSES 5264	Microbial Ecology	
CSES 5453	Soil Chemistry	

**Total Hours** **18**

## Crop, Soil and Environmental Sciences Courses

### 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 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 or higher (to include MATH 1213, MATH 1284C, MATH 1514, MATH 2213, MATH 2043, MATH 2053, MATH 2445, MATH 2514, MATH 2554, MATH 2564, or MATH 2574) 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 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 355V. 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 3703. Precision Agriculture for Crops. 3 Hours.**

This course will provide students with a practical understanding of precision agriculture and crop/ecosystem monitoring with remote and proximal sensing technology. Prerequisite: MATH 1203 and CSES 1203. (Typically offered: Spring)

**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 2323. (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. Pre- or Corequisite: 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 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)

**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 equivalent to ENSC 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. (Typically offered: Fall and Spring)

**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: Drill Component. Prerequisite: Honors standing. (Typically offered: Fall and Spring)  
This course is equivalent to ENSC 1003.

**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 of 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: AGECE 1103 or ECON 2023. (Typically offered: Spring) This course is cross-listed with AGECE 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 400VH. Honors Special Problems. 1-3 Hour.**

Work on special problems in environmental science or related fields. Prerequisite: Honors Standing. (Typically offered: Irregular) May be repeated for up to 8 hours of degree credit. This course is equivalent to ENSC 400V.

**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 4033. Analysis of Environmental Contaminants. 3 Hours.**

Methods of analysis for inorganic and organic contaminants, and microorganisms in soil and water. Quality assurance and quality control, sampling protocols, sample handling, instrumentation and data analysis. Lecture 3 hours per week. Pre- or Corequisite: CHEM 2613 and CHEM 2611L or CHEM 3603 and CHEM 3601L. (Typically offered: Spring Even Years)

**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)