

# Crop, Soil and Environmental Sciences (CSES)

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Crop, Soil and Environmental Sciences Website

Courses in the Department of Crop, Soil and Environmental Sciences provide fundamental and applied studies in two majors:

- Crop Science (<http://catalog.uark.edu/undergraduatecatalog/collegesandschools/dalebumperscollegeofagriculturalfoodandlifesciences/cropmanagementcpmg/>)
- Environmental, Soil and Water Science (<http://catalog.uark.edu/undergraduatecatalog/collegesandschools/dalebumperscollegeofagriculturalfoodandlifesciences/environmentalsoilandwaterscienceesws/>)

Areas studied within the Crop Science major include crop science, production agriculture, plant breeding and genetics, crop and forage production, pest management (weeds, insects, and plant diseases), and soil fertility. 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.

Many graduates from both majors also choose to continue their education in graduate programs in a wide variety of disciplines both related and complementary to the B.S.A. degrees.

## Crop Science (CPSC)

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Opportunities for employment and post-graduate study are numerous for graduates of the Department of Crop, Soil, and Environmental Sciences. Crop Science graduates become involved in crop production or find employment in public agencies providing support services for agriculture (e.g., Extension Service, State Plant Board, Natural Resources Conservation Service), or as consultants serving production agriculture, in the agrichemical and seed industries, and in agricultural research programs.

The crop science major includes courses in crop management, production agriculture, plant breeding and genetics, crop and forage production, pest management (weeds, insects, and plant diseases), and soil fertility.

## Requirements for a Major in Crop Science (CPSC)

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

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

<b>English/Communications</b>		<b>15</b>
<b>ENGL 1013</b>	<b>Composition I (ACTS Equivalency = ENGL 1013)</b>	
<b>ENGL 1023</b>	<b>Composition II (ACTS Equivalency = ENGL 1023)</b>	
ENGL 2003	Advanced Composition or ENGL 305 Technical and Professional Writing (ACTS Equivalency = ENGL 2023)	
COMM 1313	Public Speaking (ACTS Equivalency = SPCH 1003)	
CSES 3023	Crop, Soil, and Environmental Sciences Colloquium	
<b>US History or Government</b>		<b>3</b>
<b>Select 3 hours U.S. History course from University Core.</b>		
<b>Mathematics and Computer Science</b>		<b>6</b>
<b>MATH 1203</b>	<b>College Algebra (ACTS Equivalency = MATH 1103) (or higher level MATH)</b>	
Select one of the following:		
ASTM 2903	Agricultural and Human Environmental Sciences Applications of Microcomputers	
STAT 2303	Principles of Statistics (ACTS Equivalency = MATH 2103)	
<b>Physical and Biological Sciences</b>		<b>18-23</b>
<b>BIOL 1543 &amp; BIOL 1541L</b>	<b>Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)</b>	
BIOL 1613 & BIOL 1611L	Plant Biology (ACTS Equivalency = BIOL 1034 Lecture) and Plant Biology Laboratory (ACTS Equivalency = BIOL 1034 Lab) or CSES 12 (Introduction to Plant Sciences)	
CHEM 2613 & CHEM 2611L	Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)	
Select one CHEM group (4-8 hours)		
<b>CHEM 1073 &amp; CHEM 1071L</b>	<b>Fundamentals of Chemistry (ACTS Equivalency = CHEM 1214 Lecture) and Fundamentals of Chemistry Laboratory (ACTS Equivalency = CHEM 1214 Lab)</b>	
<b>CHEM 1103 &amp; CHEM 1101L</b>	<b>University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)</b>	
AND		
<b>CHEM 1123 &amp; CHEM 1121L</b>	<b>University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)</b>	
Select one of the following:		
BIOL 4303		
ANSC 3123	Principles of Genetics	
POSC 3123	Principles of Genetics	
BIOL 2323	General Genetics	

**Fine Arts and Humanities 6**

Select one Fine Arts course and one Humanities course from University Core.

**Social Sciences 9****AGEC 1103 Principles of Agricultural Microeconomics**

Select 6 hours from Social Sciences from University Core (3 hours must be outside AGEC/ECON discipline)  
Students minoring in Agricultural Business should choose AGEC 2103\*.

**CPSC Requirements 26****General Agronomy**

CSES 2103 Crop Science  
& CSES 2101L and Crop Science Laboratory

CSES 2203 Soil Science  
& CSES 2201L and Soil Science Laboratory

CSES 4013 Advanced Crop Science

CSES 4224 Soil Fertility

Select one from the following (3 hours)\*\*:

CSES 462V Internship

CSES 400V Special Problems

Select at least 8 hours from the following two groups. At least 6 hours must be from Group A.

**Group A**

CSES 3312 Cotton Production

CSES 3322 Soybean Production

CSES 3332 Rice Production

CSES 3342 Cereal Grain Production

**Group B**

CSES 3214 Soil Resources and Nutrient Cycles

CSES 355V Soil Profile Description ((1-2 hours))

CSES 400V Special Problems ((1-6 hours))

CSES 4103 Plant Breeding

CSES 4303 Bioenergy Feedstock Production

CSES 4253 Soil Classification and Genesis

ENSC 3103 Plants and Environmental Restoration

ENSC 3263 Soil and Water Conservation

HORT 2303 Introduction to Turfgrass Management

PLPA 4333 Biotechnology in Agriculture

**Pest Management 10**

ENTO 3013 Introduction to Entomology

PLPA 3003 Principles of Plant Pathology  
& PLPA 3001L and Principles of Plant Pathology Laboratory

CSES 4133 Ecology and Morphology of Weedy and Invasive Plants

or CSES 414 Principles of Weed Control

**CPSC Requirements 9-12**

Select one group (C-G) for CPSC Requirements (9-12 hours). Courses selected within major cannot be taken for duplicate credit. Students who wish to declare a minor must contact the Bumpers College Dean's Office.

**Group C - Pest Management (9 hours)**

CSES 4133 Ecology and Morphology of Weedy and Invasive Plants

or CSES 414 Principles of Weed Control

PLPA 4223 Plant Disease Control

ENTO 4123 Insect Pest Management

**Group D - Agricultural Business (12 hours)**

AGEC 2303 Introduction to Agribusiness

AGEC 3403 Farm Business Management

Select 3 hours from the following:

Core elective hours from approved list in AGBS-Minor

Select 3 hours from the following:

Controlled elective hours from approved list in AGBS-minor (3 hours)

**GROUP E - Crop Biotechnology (10 hours)**

PLPA 4333 Biotechnology in Agriculture

CSES 400V Special Problems

(2 2-hr courses taken in two different semesters)

Choose 6 hours from the following:

BIOL 4303

CHEM 3813 Elements of Biochemistry

CSES 4103 Plant Breeding

**GROUP F - Soil Science (9-10 hours)**

CSES 3214 Soil Resources and Nutrient Cycles

ENSC 3263 Soil and Water Conservation

CSES 355V Soil Profile Description ((1 hour, may take twice for credit))

CSES 4253 Soil Classification and Genesis

ENSC 4263 Environmental Soil Science

ENSC 4401 Professional Certification Preparation

CSES 4553 Wetland Soils

**GROUP G - Natural Resources Management (9 hours)****ENSC 1003 Environmental Science & ENSC 1001L and Environmental Science Laboratory**

Select at least 5 hours from the following:

ENSC 3003 Introduction to Water Science

AGEC 3413 Principles of Environmental Economics  
or ENSC 344 Principles of Environmental Economics

AGEC 3503 Agricultural Law I

AGEC 3523 Environmental and Natural Resources Law

BIOL 3861L General Ecology Laboratory

BIOL 3863 General Ecology

CSES 4133 Ecology and Morphology of Weedy and Invasive Plants

CSES 4553 Wetland Soils

CSES 462V Internship ((3 hours))

ENSC 3003 Introduction to Water Science

ENSC 3103 Plants and Environmental Restoration

ENSC 3223 Ecosystems Assessment

ENSC 3603 GIS for Environmental Science

ENSC 4021L Water Quality Laboratory

ENSC 4023 Water Quality

ENSC 4033 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

**GENERAL ELECTIVES 10-18**

UNIV 1001 University Perspectives (****)	
<b>Total Hours</b>	<b>120</b>

\*Students minoring in Agricultural Business should choose AGECE 2103 in the Social Sciences block and will need to select another course in the list of AGBS-M Controlled Electives (as part of the General Electives for the CPSC major) to fulfill the requirements for the minor.

\*\*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/AFLS 401VH, or CSES 462V International Research Internship (SU) may be used in fulfilling the General Agronomy requirement.

\*\*\*If students declare a minor, then no more than 9 credit hours of courses selected within major (including courses within the CPSC Requirements Groups C-G) can be taken for duplicate credit in applying toward a minor associated with CPSC Requirements Groups C-G.

\*\*\*\* UNIV 1001 required for new freshmen only.

**Crop Science B.S.A. Nine-Semester Degree Program**

Because the Crop Science program requires an internship, it doesn't qualify for the Eight-Semester Program. See more about the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) for university requirements of the program.

	Units		
	Fall	Spring	Summer
ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)	3		
MATH 1203 College Algebra (ACTS Equivalency = MATH 1103) (Satisfies General Education Outcome 2.1)	3		
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		
U.S. History or Government State Minimum Core Elective (Satisfies General Education Outcome 4.2)	3		
UNIV 1001 University Perspectives	1		
CSES 2103 Crop Science & CSES 2101L Crop Science Laboratory		4	
CSES 1203 Introduction to Plant Sciences or BIOL 1613 and BIOL 1611L		3-4	
ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023) (If exempt, see adviser for communication courses.) (Satisfies General Education Outcome 1.1)		3	

COMM 1313 Public Speaking (ACTS Equivalency = SPCH 1003) (Satisfies General Education Outcomes 1.2 and 5.1)		3
AGECE 1103 Principles of Agricultural Microeconomics (Satisfies General Education Outcome 3.3)		3
<b>Year Total:</b>	<b>14</b>	<b>16</b>

	Units		
	Fall	Spring	Summer
Satisfies General Education Outcome 3.4:			
CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 1101L University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab) or CHEM 1073 and CHEM 1071L	4		
ENGL 2003 Advanced Composition or ENGL 3053 Technical and Professional Writing (ACTS Equivalency = ENGL 2023)	3		
Social Science State Minimum Core Elective (Satisfies General Education Outcome 3.3)	3		
Fine Arts or Humanities State Minimum Core Elective (Satisfies General Education Outcome 3.1 or 3.2) <sup>1, 2</sup>	3		
Select one (1) course from Group A or B on checksheet	2-3		
CHEM 2613 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) & CHEM 2611L Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab) or CHEM 1123 and CHEM 1121L			4
ASTM 2903 Agricultural and Human Environmental Sciences Applications of Microcomputers or STAT 2303 Principles of Statistics (ACTS Equivalency = MATH 2103)			3
Social Science State Minimum Core Elective (Satisfies General Education Outcomes 3.3 and 4.1) <sup>3</sup>			3
Fine Arts or Humanities State Minimum Core Elective (Satisfies General Education Outcome 3.1 or 3.2) <sup>1, 2</sup>			3
Select one (1) course from Group A or B on checksheet			2-3
<b>Year Total:</b>	<b>15</b>	<b>16</b>	

Third Year	Units		
	Fall	Spring	Summer
PLPA 3003 Principles of Plant Pathology & PLPA 3001L Principles of Plant Pathology Laboratory	4		
ENTO 3013 Introduction to Entomology	3		
Select one (1) course from Group A on checksheet	2		
CSES 2203 Soil Science & CSES 2201L Soil Science Laboratory	4		
General Elective or CHEM 2613/2611L	4		
Select one of the following:		3	
BIOL 2323 General Genetics			
BIOL 4303			
ANSC/POSC 3123 Principles of Genetics			
Select one (1) course from Group A or B on checksheet		2-3	
CPSC Requirement Elective		3	
General Elective <sup>4</sup>		6	
Choose 3 hours from the following:			3
CSES 462V Internship (Satisfies General Education Outcome 6.1)			
CSES 400V Special Problems			
AFLS 401V Special Topics in AFLS			
Year Total:	17	14	3

Fourth Year	Units		
	Fall	Spring	Summer
CSES 3023 Crop, Soil, and Environmental Sciences Colloquium (Satisfies General Education Outcome 6.1)	3		
CSES 4133 Ecology and Morphology of Weedy and Invasive Plants	3		
CSES 4224 Soil Fertility	4		
CPSC Requirement Elective	3		
CSES 4013 Advanced Crop Science		3	
CPSC Requirement Elective		3	
General Electives <sup>4</sup>		0-7	
Year Total:	13	13	

**Total Units in Sequence: 121**

<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.

## 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/genes/stateminimum/>) and discipline specific general education (<http://catalog.uark.edu/undergraduatecatalog/genes/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</b>	<b>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>
<b>BIOL 1543 &amp; BIOL 1541L</b>	<b>Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)</b>	
BIOL 2013 & BIOL 2011L	General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)	
BIOL 3863 & BIOL 3861L	General Ecology and General Ecology Laboratory or ENSC 3223 Ecosystems Assessment & ENSC 3224 Lab Ecosystems Assessment Laboratory	
<b>CSES 1203</b>	<b>Introduction to Plant Sciences</b>	
<b>CHEM 1103 &amp; CHEM 1101L</b>	<b>University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)</b>	
<b>CHEM 1123 &amp; CHEM 1121L</b>	<b>University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)</b>	
CHEM 2613 & CHEM 2611L	Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)	
or CHEM 3603 & CHEM 3601L	Organic Chemistry I and Organic Chemistry I Laboratory	
<b>GEOS 1113 &amp; GEOS 1111L</b>	<b>Physical Geology (ACTS Equivalency = GEOL 1114 Lecture) and Physical Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab)</b>	
<b>PHYS 2013 &amp; PHYS 2011L</b>	<b>College Physics I (ACTS Equivalency = PHYS 2014 Lecture) and College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)</b>	
<b>Fine Arts and Humanities</b>		<b>6</b>
<b>Select 3 hours Fine Arts from state minimum core</b>		
<b>Select 3 hours Humanities from state minimum core</b>		
<b>Social Sciences</b>		<b>9</b>
<b>Select 9 hours Social Sciences from state minimum core</b>		
<b>ESWS Requirements*</b>		
<b>Environmental Science Core</b>		<b>17</b>
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)	
<b>Soil Science Core</b>		
Select one of the following:		<b>3-4</b>
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)	
<b>Water Science Core</b>		
Select one of the following:		<b>3</b>
ENSC 4023	Water Quality	
GEOS 3333	Oceanography	
GEOS 4033	Hydrogeology	
GEOS 4363	Climatology	
GEOS 4473	Applied Climatology	
<b>Natural Resources Core</b>		
Select 9 hours from the following two groups:		<b>9</b>
<b>Environmental Science**</b>		
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	Water Quality Laboratory	
ENSC 4401	Professional Certification Preparation	
GEOS 3043	Sustaining Earth	
GEOS 3543	Geospatial Applications and Information Science	
<b>Environmental Studies (0-3 hours)</b>		
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		<b>16-17</b>
<b>Total Hours</b>		<b>120</b>

\*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	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
Year Total:	15	16

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
Year Total:	16	16

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
<b>Total Units in Sequence:</b>		<b>120</b>

- <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 Crop Biotechnology (CPBT-M)

A student planning to minor in Crop Biotechnology must notify the program adviser for consultation and more detailed information. The Crop Biotechnology Minor consists of 16 hours of courses and to include the following:

### Core Courses

PLPA 4333	Biotechnology in Agriculture	3
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### Genetics

CSES 400V	Special Problems (two 2-hour courses taken in two different semesters)	4
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Select one of the following: 3

BIOL 2323	General Genetics	
ANSC/POSC 3123	Principles of Genetics	

### Controlled Electives

Select two of the following: 6

BIOL 4303		
CHEM 3813	Elements of Biochemistry	
CSES 4103	Plant Breeding	

**Total Hours 16**

## Minor in Crop Science (CPSC-M)

A student planning to minor in Crop Science must notify the program adviser for consultation and more detailed information. The Crop Science Minor consists of 18 semester hours of 2000-level courses or above, including the following:

CSES 2103	Crop Science	3
CSES 2203	Soil Science	3

Select 12 hours with at least 4 hours coming from Group A: 12

Group A		
CSES 3312	Cotton Production	
CSES 3322	Soybean Production	
CSES 3332	Rice Production	
CSES 3342	Cereal Grain Production	
Group B		
CSES 3214	Soil Resources and Nutrient Cycles	
CSES 4013	Advanced Crop Science	
CSES 4103	Plant Breeding	
CSES 4133	Ecology and Morphology of Weedy and Invasive Plants	
CSES 4143	Principles of Weed Control	
CSES 4224	Soil Fertility	

**Total Hours 18**

## Faculty

**Bacon, Robert Keith**, Ph.D. (Purdue University), M.S., B.S.A., (University of Arkansas), Professor, 1984, 1993.

**Barber, Thomas**, Ph.D., M.S., B.S. (University of Arkansas), Professor, 2007, 2016.

**Bourland, Fred**, Ph.D. (Texas A&M University), M.S., B.S.A. (University of Arkansas), Professor, 1988.

**Brye, Kristofor R.**, Ph.D., M.S. (University of Wisconsin-Madison), B.S. (University of Wisconsin-Stevens Point), University Professor, 2001, 2020.

**Burgos, Nilda Roma**, Ph.D., M.S. (University of Arkansas), B.S. (Visayas State College of Agriculture-Philippines), Professor, 1998, 2010.

**Butts, Thomas R.**, Ph.D. (University of Nebraska-Lincoln), Assistant Professor, 2019.

**Counce, Paul Allen**, Ph.D. (University of Georgia), M.S. (Purdue University), B.S. (University of Tennessee-Martin), Professor, 1983, 2003.

**Daniels, Michael B.**, Ph.D., M.S. (University of Arkansas), B.S. (Pennsylvania State University), Professor, 1996, 2006.

**De Guzman, Christian T.**, Ph.D. (Louisiana State University), B.S. (University of Philippines, Los Banos), Assistant Professor, 2020.

**Espinoza, Leonel A.**, Ph.D., M.S. (University of Florida), B.S. (Iowa State University), Associate Professor, 2003, 2007.

**Gbur, Edward E.**, Ph.D., M.S. (The Ohio State University), B.S. (Saint Francis University), Professor, 1987, 1998.

**Hardke, Jarrod T.**, Ph.D. (Louisiana State University), B.S.A. (University of Arkansas), Professor, 2013, 2020.

**Kelley, Jason**, Ph.D., M.S. (Oklahoma State University), B.S. (Kansas State University), Professor, 2003, 2019.

**Lee, Jung Ae**, Ph.D., M.S. (University of Georgia), M.A., B.A., (Ewha Womans University), Assistant Professor, 2016.

**Mason, Richard Esten**, Ph.D., B.A. (Texas A&M University), Associate Professor, 2010, 2016.

**Mauromoustakos, Andy**, Ph.D., M.S. (Oklahoma State University), B.S. (Oral Roberts University), Professor, 1989, 2002.

**Miller, David M.**, Ph.D. (University of Georgia), M.S., B.S. (Purdue University), Professor, 1988, 2001.

**Mozaffari, Morteza**, Ph.D. (University of Delaware), M.S., B.S. (University of Massachusetts), Assistant Professor, 2002.

**Mozzoni, Leandro**, Ph.D. (University of Arkansas), M.S. B.S. (Rosario National University), Associate Professor, 2017.

**Norsworthy, Jason Keith**, Ph.D., M.S. (University of Arkansas), B.S. (Louisiana Tech University), Distinguished Professor, 2006, 2019.

**Pereira, Andy**, Ph.D. (Iowa State University), M.S. (Indian Agricultural Research Institute, India), B.Sc.Ag. (Govind Ballabh Pant University of Agriculture and Technology, India), Professor, Anheuser-Busch and Arkansas Wholesalers Professorship in Molecular Genetics, 2011.

**Poncet, Aurelie**, Ph.D. (Auburn University), M.S. (Montpellier SupAgro, France), M.S. Minor: (AgroTIC), B.S. (Montpellier SupAgro, France), Assistant Professor, 2020.

**Purcell, Larry C.**, Ph.D. (University of Florida), M.S., B.S. (University of Georgia), Distinguished Professor, Ben J. Altheimer Chair for Soybean Research, 1993, 2017.

**Roberts, Trenton L.**, Ph.D. (University of Arkansas), M.S. (University of Arizona), B.S. (Oklahoma State University), Associate Professor, 2010, 2017.

**Savin, Mary Cathleen**, Ph.D., M.S. (University of Rhode Island), B.S. (University of Notre Dame), Professor, 2002, 2011.

**Scott, Robert C.**, Ph.D. (Mississippi State University), M.S., B.S. (Oklahoma State University), Professor, 2002, 2008.

**Sha, Xueyan**, Ph.D. (Louisiana State University), Professor, 2012.

**Shakiba, Ehsan**, Ph.D., M.S. (University of Arkansas), M.S., B.S. (Azad University, Iran), Assistant Professor, 2015.

**Slaton, Nathan A.**, Ph.D., M.S. (University of Arkansas), B.S. (Murray State University), Professor, 2001, 2009.

**Srivastava, Vibha**, Ph.D. (Jawaharlal Nehru University, New Delhi), M.S. (Govind Ballabh Pant University of Agriculture and Technology), B.S. (D.E.I. University), Professor, 2001, 2012.

**Thompson, Gary A.**, Ph.D. (Purdue University), M.S. (University of Wisconsin), Professor, 2020.

**Wood, Lisa S.**, Ph.D., M.S., B.S. (University of Arkansas), Clinical Associate Professor, 2012, 2019.

## 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 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)

**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 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.