The *University of Arkansas*

Dale Bumpers College of Agricultural, Food and Life Sciences

Department of Crop, Soil, and Environmental Sciences

Environmental, Soil, and Water Science
Degree Program

Undergraduate Handbook
2020-2021

10 June 2019 **Table of Contents**

UofA
UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

Department of
Crop, Soil, and Environmental Sciences

UNIVERSITY of ARKANSAS
DALE BUMPERS COLLEGE
of AGRICULTURAL, FOOD AND LIFE SCIENCES

115 Plant Science Building • Fayetteville, Arkansas 72701 • (479) 575-2354 • (479) 575-7465 (FAX)

Dear Environmental, Soil, and Water Science Student:

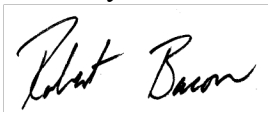
On behalf of the faculty and staff, I want to say "Welcome to the Department of Crop, Soil, and Environmental Sciences!" We are pleased that you have decided to join our departmental undergraduate program and look forward to working with you to help you succeed in your academic endeavors. The variety of academic options available to you in our department allows you to build your undergraduate program to fit your future goals.

You have been assigned an academic advisor who will work with you one-on-one to help guide you through the degree process. Be sure to work closely with your advisor and keep him or her informed of your progress and challenges so that he or she may be of help to you. The academic assistance he or she can provide you is limited only by the effort you put into keeping him or her informed of your situation. Communication is the key! Advisors are often available for drop-in visits, but it is beneficial for everyone if you can schedule an appointment so that you can both be prepared for your meeting. Appointments can be set up in UASuccess, in person, by phone, or email.

In addition to the help from your advisor, this handbook should answer many of the questions you may have pertaining to your degree program. It is provided to you as a guide to provide further assistance in helping you through your academic program. Please remember that while we do all we can to insure you are receiving the most up-to-date information available, it is your responsibility to make sure you are fulfilling your degree requirements for your program. If you have questions or concerns, please do not hesitate to ask for clarification.

I am sure you will enjoy your time at the U of A and we look forwarding to having you be part of our department. I encourage you to get to know everyone in the department. The faculty, staff, and your fellow students are all excellent sources of information and future job networking. Join the CSES Undergraduate Club and get involved in club efforts to provide you with friendship as well as professional and career building opportunities, all of which are important to becoming a well rounded individual.

Good luck on your educational endeavors and let us know how we can be of help to you!
Sincerely,



Robert K. Bacon
Department Head

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Welcome to all of you joining our ranks as undergraduate students in the Department of Crop, Soil, and Environmental Sciences! We think this is a great department and, as students, we work even harder to make sure to keep it that way.

As undergraduates in our department, we encourage you to join the CSES Undergraduate Club and participate in as many of our events as you want to and are able. On average, our club meets once a month. Our meetings are the opportunity for our members to not only hear from guest speakers, but also to get together to discuss membership needs and departmental issues. We do our best to send a contingent from our club to participate in the national meetings each year. Club members compete in poster presentations, oral presentations, and/or paper competitions.

How can you find out about our meetings and events? **Look for emails from the club through the CSES Club email or through the department. Also check the CSES department Facebook page and make sure you notice the signs in AGRI and PTSC hallways and postings in the Student Lounge (PTSC 113). Students who attend meetings can provide a phone number to be added to the club's groupme chat for regular updates and to chat with other club members, and be sure to follow us on Instagram @csesclub.**

We often schedule additional activities at the request of our members. We have previously sponsored hiking trips, picnics, and other group outings. We also do our best to give back to our community. As such we have partnered with Ozarks Water Watch to monitor Mullins Creek, a restored stream which flows through the University of Arkansas campus, as well as organizing several cleanups of waste found in and around the creek. We have worked with various non-profits such as Beaver Watershed Alliance and Illinois River Watershed Partnership to help remove invasive plant species from multiple areas around Fayetteville and plant native species in their place, and we have helped in several maintenance efforts for local hiking trails and stream ecosystems.

As you can tell, our goal is to provide our members with meetings and activities that are beneficial to them academically as well as personally. We are always looking for new ideas for things we can do. Please feel free to get in touch with me, one of the other officers or advisors (contact information is on page 21), or come to one of our meetings.

We look forward to having you as part of our department!

Sincerely,
Ashley Smith

Opportunities in Environmental, Soil, and Water Science

Dr. Mary C. Savin

Are you interested in the environment? Do you want to understand how soil and water ecosystems work to better manage our natural resources? How can managing ecosystems help reduce carbon dioxide concentrations in the atmosphere and global warming? How can soybeans fertilize the soil, improve human health, feed animals, and provide fuel all at the same time? What happens in the streams when soil, fertilizer nutrients, pathogens, and pesticides are transported from the land into water ecosystems? If you answered "Yes" to the first two questions above, and you want to know more to answer the other questions, then you may want to refer to the academic programs in the Crop, Soil, and Environmental Sciences Department (CSES) at the University of Arkansas in Fayetteville. The CSES Department offers two majors, environmental, soil and water science (ESWS) and crop science, which can provide the educational opportunities that will allow you to answer the questions. The **ESWS major** emphasizes understanding of the properties and processes in soil and water systems so that we can manage our environments properly and sustainably. There is also plenty of opportunity to pick up courses and earn a minor as well as a major. The Crop, Soil, and Environmental Sciences Department offers five minors. An additional campus-wide minor in Sustainability is available, and students can select other minors in or outside the Bumpers College.

Courses in ESWS include introductory courses in each of the three areas: **environment, water, and soil**. Students also take more advanced courses. In choosing which advanced courses to take to fulfill degree requirements (because there is some flexibility), students cover the three areas of environmental, soil, and water sciences. These courses are all under laid by a strong foundation in the basic sciences, including biology, chemistry, physics, and geology. The flexibility in the ESWS degree is helpful for students to customize course selection to emphasize specific interests. Transfer students can benefit from the program flexibility.

Some students go onto science based careers; other include more social sciences in their degree. Our graduates go into a variety of careers ranging from wastewater treatment and management to environmental consulting to positions in private companies dealing with environmental issues. Some of our graduates have gotten positions with environmental waste management companies or with agencies designing land management plans to minimize contamination of nearby water sources. Our graduates pursue careers in government, industry, and academia. One graduate, for example, combined his science knowledge with his interests in public policy and obtained his first position after college with the United Nations University Institute for Sustainability and Peace. Many students opt to pursue advanced graduate degrees such as, but not limited to, M.S. and Ph.D. degrees.

Before graduating, ESWS students can participate in the **CSES Club** and put their education to work, initiating outreach projects in the community. Previously, the club had adopted a wetland in Bryce Davis, a City of Fayetteville park, to remove invasive plant species and restore native plants to the area. Students continued to make progress on restoration of the wetland for many years. The Club has helped restore a streambank along one of the city's walking and biking trails to stabilize the soil and help restore native vegetation. Club members worked with Holt Middle School in their school garden. Club members composted campus food waste using an in-vessel system. Our Club is affiliated with the Students of Agronomy, Soil, and Environmental Sciences and sends representatives to the

American Society of Agronomy annual meetings. The undergraduates have traveled to cities such as Denver, Salt Lake City, New Orleans, Pittsburgh, San Antonio, Long Beach, and Minneapolis. Participants have placed first, second, or third in the national Club Poster Contest highlighting club activities for twelve of the last sixteen years.

Students participate in research. Our college, Bumpers College (AFLS), provides grants to students who write proposals and successfully convince review panels to fund projects. We also have a college journal, ***Discovery The Student Journal of the Dale Bumpers College for Agricultural, Food and Life Sciences*.** Thirty-one of the papers published from 2006 to 2018 were written by Crop, Soil, and Environmental Sciences students working with at least 15 of our CSES faculty as mentors. The CSES students are also active in the AFLS Honors Program; they complete research projects and prepare an honors thesis. More details are available at (http://bumpershonors.uark.edu/index.php). **Students study abroad**. They have participated in service learning projects in Belize, and have traveled to Austria, Belgium, Brazil, France, Germany, Greece, India, Italy, Scotland, and Spain for summer study trips, for a semester, or most recently with CSES faculty during the January (**India – Merging Diverse Traditions into Modern Life**) and May (**Belgium - Sustainability in the Euro Food System**) intersessions. Some students have traveled as far as New Zealand, participated in internships in Australia, or research in Brazil. Other students participate in internships closer to home with governmental agencies or private companies. Many benefit, whether they study abroad or here in Fayetteville, from the numerous **scholarships** available to students. CSES students have been receiving about $100,000 in scholarships the last several years. The enrollment in the ESWS major has been about 120-150 students. With increased interest in the sciences of the environment, both the direction and scope of departmental research and teaching programs have evolved. **Courses include nutrient cycling, restoration, environmental contaminants, and wetland soils.** Soil Profile Descriptions is an example of a course where students develop and practice skills describing and interpreting soil features. Students participating in that course can compete in regional soil judging competitions. Classes from the past several years have been so successful in the regional competition that they have competed in the national competition in the spring.

Students who want to demonstrate professionalism and give themselves a boost in the job market can **participate in professional certification programs**. Preparatory courses for national certification examinations are offered in spring semesters. Students review and synthesize material from their courses, and then take a certification examination. Passing the General Environmental Science examination offered by the Institute of Professional Environmental Practice allows our students to become Environmental Professional Interns. Passing the Soil Science Fundamentals examination offered by the Soil Science Society of America with the Council of Soil Science Examiners allows our students to pursue Associate Professional Soil Scientist status.

These are just some of the many opportunities available to ESWS students. For more information about the Environmental, Soil, and Water Science major, the Natural Resources Management minor, Soil Science minor, Crop Science major or minor, Crop Biotechnology, or Pest Management minors, please check out http://cses.uark.edu/, call (479) 575-5740, or visit us on campus at 115 Plant Science Building. For more information on the Sustainability minor, please check: http://sustainability.uark.edu/academics/index.php.

The Department of Crop, Soil, and Environmental Sciences

(Information adapted from the CSES Departmental Website)

The Department of Crop, Soil, and Environmental Sciences at the University of Arkansas has a long and honored tradition of excellence in teaching, research and service. The Department has produced a large number of successful graduates currently employed in the public and private sectors. We strive to have our best teachers in the introductory classes and to have faculty who are actively pursuing research in their respective disciplines teaching the classes related to their specialty.

Majors, Minors, and Careers

Within the Crop, Soil, and Environmental Sciences Department students can major in two degree programs, **Environmental, Soil, and Water Science** and **Crop Science**. The degree check sheet for the **Environmental, Soil, and Water Science** major is given on page 8. The major provides students with basic and applied courses that allow our graduates to be highly competitive in the job market.

The Environmental, Soil, and Water Science Major

Why is Environmental, Soil, and Water Science important?

- Awareness of environmental issues
- Increasing world population
- Public demands for clean air and water, and a healthy food supply
- Conservation of natural resources

Who should be interested?

The Environmental, Soil, and Water major is for students interested in issues such as water quality, proper use of soils, land application of wastes, proper use of fertilizers, fate of pesticides in soil and water, remediation of contaminated soils and waters, and wetlands. The major provides a strong science background, as well as a practical education.

Career Opportunities

Students who graduate in Environmental, Soil, and Water Science can work in such areas as:

Local, State, or Federal Governmental Agencies

- Arkansas Soil and Water Conservation Commission
- Arkansas Department of Environmental Quality
- Arkansas Department of Health
- Cooperative Extension Service
- Environmental Protection Agency (EPA)
- United State Department of Agriculture (USDA)
- Natural Resource Conservation Service (NRCS)
- Forest Service (FS)
- Fish and Wildlife Service

Private Sector

- Environmental consulting
- Land-use planning
- Waste management
- Industry

Academia/Research

- Many students go on to Graduate School to further their education
- Research Technician

Certification Possibilities - Coursework prepares students to take the Certified Professional Soil Science exam or the Environmental Professional Intern certification exam. Preparation courses for the certification exams are offered as ENSC 4401 Professional Certification Preparation (SP).

Minor Fields for Environmental, Soil, and Water Science Majors

Students majoring in Environmental, Soil, and Water Science are encouraged to select a minor in an area of interest utilizing elective hours. Minors offered by the CSES Department are **Natural Resources Management, Soil Science, Crop Biotechnology, Crop Science,** and **Pest Management**. Check sheets for these CSES minors are given starting on page 9. *If a minor is selected, students must declare the minor in the AFLS Dean's Office (AFLS E-202) to have it officially entered into the UAConnect system.*

Bumpers College Minors. Twenty-four minors are offered by the Bumpers College. In addition to the minors offered in the CSES Department, other options include: Agribusiness; Agricultural Communication; Agricultural Education; Agricultural Leadership; Agricultural Systems Technology Management; Animal Science; Entomology; Equine Science; Event Management; Food Science; Horticulture; Hospitality; Human Development and Family Sciences; Human Nutrition; International Economic Development; Landscape Horticulture; Plant Pathology; Poultry Science; and Turf Management.

Fulbright College Minors. Forty-eight minors are offered by the Fulbright College including: Biology, Chemistry, Geology, Communication, foreign languages, and Geography.

Walton College Minors. The Walton College offers a Business Administration Minor for non-business students. Twelve minor concentrations are offered for non-business majors: General Business, Accounting, Business Economics, Enterprise Resource Planning, Enterprise Systems, Finance, Information Systems, International Business, Management, Marketing, Retail, and Supply Chain Management.

University Minor. A campus-wide minor in Sustainability is available.

Advising Responsibilities

In the Bumpers College and in the Department of Crop, Soil, and Environmental Sciences at the University of Arkansas we are committed to strong, effective advising. Effective advising is a partnership between the student and the faculty advisor. Each person has responsibilities.

Advisor Responsibilities	Student Responsibilities
know degree requirements	be responsible for self
know resources & services to direct students	be familiar with deadlines
understand sequence of courses	know degree plan requirements
provide guidance & advice	use your University of Arkansas email
	use available resources
	communicate with advisor & instructors to develop positive relationships

UA Advising Goals

"Academic advising is an active, ongoing partnership between the advisors and students grounded in teaching and learning. Advising is based on students gaining accurate and appropriate information and direction to help make their educational experience relevant, coherent, and meaningful. It is a process that assists students in connecting with the University of Arkansas, making thoughtful decisions related to their academic experiences, and maximizing their education and career opportunities. Quality academic advising is essential to achieving the University's vision." (AFLS Academic Advising Syllabus)

For more information about advising in Bumper's College, see https://bumperscollege.uark.edu/current-students/advising.php.

DEPARTMENT OF CROP, SOIL, AND ENVIRONMENTAL SCIENCES
Check Sheet for Environmental Soil and Water Science Major (ESWSBS)
2020-2021

STUDENT_____ STUDENT'S ID _____ ADVISOR _____

COMMUNICATIONS (12 hrs)
____ ENGL 1013
____ ENGL 1023
____ COMM 1313
____ CSES 3023 (FA, Jr or Sr, COMM 1313) or AGED 3143

US HISTORY OR GOVERNMENT (3 hrs)
_____HIST 2003 or ____ HIST 2013 or ____ PLSC 2003

MATHEMATICS (6 hrs)
____ MATH 1203
____ MATH 1213 (higher level MATH is encouraged for students with ACT >26 and considering graduate school)

PHYSICAL, CHEMICAL, AND BIOLOGICAL SCIENCES (35 hrs)
____ BIOL 1543 and ____ BIOL 1541L Principles of Biology
____ BIOL 2013 and ____ BIOL 2011L General Microbiology

____ BIOL 3863 and ____ BIOL 3861L General Ecology **OR**
____ ENSC 3223 and ____ ENSC 3221L Ecosyst Assess (FA-E, BIOL 1543)

____ CSES 1203 Intro to Plant Sciences
____ CHEM 1103 and ____ CHEM 1101L University Chemistry I
____ CHEM 1123 and ____ CHEM 1121L University Chemistry II

____ CHEM 2613 and ____ CHEM 2611L Organic Phys. Chem. **OR**
____ CHEM 3603 and ____ CHEM 3601L Organic Chem I

____ GEOS 1113 and ____ GEOS 1111L General Geology
____ PHYS 2013 and ____ PHYS 2011L College Physics I (MATH 1213)

FINE ARTS AND HUMANITIES (6 hrs)
Category A: Fine Arts *Choose one from the following courses:*
___ ARCH 1003 Architecture Lecture
___ ARHS 1003 Art Lecture
___ COMM 1003 Film Lecture
___ DANC 1003 Dance
___ ENGL 2023 Creative Writing I
___ HUMN 2114H Honors Birth of Modern Culture 1600-1900
___ LARC 1003 The American Landscape
___ MLIT 1003 Music Lecture
___ MLIT 1013 Music Lecture for Music Majors
___ THTR 1003 Theater Appreciation
___ THTR 1013 Musical Theater Appreciation

Category B: Humanities *Choose one from the following courses:*
___ AAST 2023 The African American Experience
___ ARCH 1013 Diversity and Design
___ CLST 1003 Intro to Classical Studies: Greece
___ CLST 1013 Intro to Classical Studies: Rome
___ COMM 1233 Media, Community and Citizenship
___ ENGL 1213 Introduction to Literature
___ GNST 2003 Intro to Gender Studies
___ HUMN 1124H Honors Equilibrium of Cultures
___ HUMN 2124H Honors 20th Century Global Culture
___ MUSY 2003 Music in World Cultures
___ PHIL2003 Introduction to Philosophy
___ PHIL 2103 Introduction to Ethics
___ PHIL 2203 Logic
___ PHIL 3103 Ethics and the Professions
___ WLIT 1113 World Literature
___ WLIT 1123 World Literature II
___ Any Intermediate I Foreign Language

SOCIAL SCIENCES (9 hrs)

____ AGEC 1103	____ AGEC 2103	____ COMM 1023
____ ANTH 1023	____ ECON 2013	____ ECON 2023
____ ECON 2143	____ GEOS 1123	____ GEOS 2003
____ HDFS 1403	____ HDFS 2413	____ HIST 1113
____ HIST 1123	____ HIST 2003	____ HIST 2013
____ HUMN 1114H	____ HUMN 2114H	____ PLSC 2003
____ PLSC 2013	____ PLSC 2203	____ PSYC 2003
____ RESM 2853	____ HDFS 2603	
____ SOCI 2013	____ SOCI 2033	

DEPARTMENTAL REQUIREMENTS (32-33 hrs)

ENVIRONMENTAL SCIENCE CORE (17 hrs, required)

____ ENSC 1003 Environmental Science (FA, SP)
____ ENSC 1001L Environmental Science Lab (FA, SP)
____ AGME 2903 Ag & Human Environ. Sci. Applications of Microcomputers (SP, SU, FA)
____ CSES 2203 Soil Science (FA, SP, MATH 1203, CHEM 1103 or CHEM 1074)
____ CSES 2201L Soil Science Lab (FA, SP, co-req CSES 2203)
____ ENSC 3003 Introduction to Water Science (SP, MATH 1203, ENSC 1003 or other science (see syllabus)
____ AGST 4023 Principles of Experimentation (FA, MATH 1203) **OR**_STAT 2303Principles of Statistics (SP, SU, FA, MATH 1203)

Select 2nd SOIL SCIENCE core (3-4 hrs)

____ CSES 3214 Soil Resources w/Lab Component (SP-O, CSES 2203,
____ CSES 4224 Soil Fertility w/Lab Component (FA, CSES 2203, CHEM 1123/1121L or CHEM 1073/1071L and CHEM 2613/2611L)
____ CSES 4253 Soil Classification & Genesis w/Lab Component (FA-O, CSES 2203/2201L)
____ CSES 4553 Wetland Soils (SP-O, CSES 2203, CSES 2201L or CSES 355V)
____ ENSC 3263 Soil & Water Conservation (FA-E, CSES 2203)
____ ENSC 4263 Env. Soil Science (SP-E, CSES 3214, PHYS 2013/2011L)

Select 2nd WATER SCIENCE core (3 hrs)

____ ENSC 4023 Water Quality (FA, CHEM 1123/1121L, BIOL 1543/1541L)
____ GEOS 3333 Oceanography (SP-E, junior standing)
____ GEOS 4033 Hydrogeology w/Lab Component (SP, MATH 2554,MATH 2043, GEOL 3514)
____ GEOS 4363 Climatology (SP) GEOS 1133 or GEOS 4353
____ GEOS 4473 Applied Climatology (FA)

NATURAL RESOURCES CORE

(Select 9 credit hours from the following 2 groups)

ENVIRONMENTAL SCIENCE (6-9 hrs)*

____ AGME 3153 Surveying in Agriculture and Forestry (FA)
____ CSES 2013 Pest Management (SP)
____ CSES 355V Soil Profile Descriptions (FA, 1 credit, may take twice)
____ CSES 4553 Wetland Soils (SP-O, CSES 2203, CSES 2201L or CSES 355V)
____ CSES 462V Internship (SP, SU, FA, Jr. standing, 1-3 credit hours)
____ ENSC 3103 Plants & Environmental Restoration (FA, CSES 1203 or HORT 2003 or BIOL 1613)
____ ENSC 3263 Soil & Water Conservation (FA-E, CSES 2203)
____ ENSC 3603 GIS for Environmental Science (SP-O, CSES 2203)
____ ENSC 4034 Analysis of Environmental Contaminants w/Lab Component (SP-E, CHEM 2613/2611L or higher CHEM))
___ ENSC 4021L Water Quality Lab (FA, ENSC 4023)
____ ENSC 4401 Professional Certification Preparation (SP)
____ GEOS 3043 Sustaining Earth (FA, SP, SU, Jr. Standing)
____ GEOS 3543 Geographic Information Science (FA, SP, online)

ENVIRONMENTAL STUDIES (0-3 hours)

____ AGEC 3413 Principles Environ. Econ. (SP, AGEC 1103 or ECON 2023)
____ AGEC 3503 Agricultural Law (FA)
____ AGEC 3523 Environmental and Natural Resources Law (SP-E)
____ ENSC 3933 Environmental Ethics (SP-O, ENSC 1003 or PHIL 2003 or PHIL 2103)
____ SOCI 4603 Environmental Sociology (SP)

GENERAL ELECTIVES (16 - 17 hrs)

____ UNIV 1001 University Perspectives

____ _____ _____ ____ _____ _____
____ _____ _____ ____ _____ _____
____ _____ _____ ____ _____ _____

OTHER REQUIREMENTS FOR B.S. DEGREE:

*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

120 total semester hours of which:

9 hrs outside the Departmental Alpha Codes within the Bumpers College
36 semester hours in upper division courses
Courses taken within major cannot be taken for duplicate credit 2.00 GPA

UNIVERSITY OF ARKANSAS
Dale Bumpers College of Agricultural, Food and Life Sciences
NATURAL RESOURCES MANAGEMENT MINOR
2020-2021

* A student planning to minor in Natural Resources Management must notify the program adviser for consultation and more detailed information.
* The Natural Resources Management Minor will consist of a total of 18 hours to be comprised of the following required and optional courses. No more than 9 hours can be counted towards a Natural Resources Management minor with an ESWS major.

Required Courses (7 hours)
____ ENSC 1001L Environmental Science Laboratory (FA, SP)
____ ENSC 1003 Environmental Science (FA, SP) **AND**
____ CSES 2203 Soil Science (FA, SP, MATH 1203, CHEM 1103 or CHEM 1074) **OR**
____ ENSC 3003 Introduction to Water Science (SP, MATH 1203, ENSC 1003 or other sci.)

Optional Courses Select the remaining 11 hours, with at least 8 hours 3000-level or above.
____ AGEC/ENSC 3413 Principles of Environmental Economics (SP, AGEC 1103 or ECON 2023)
____ AGEC 3503 Agricultural Law I (FA)
____ AGEC 3523 Environmental and Natural Resources Law (SP even)
____ BIOL 3861 General Ecology Lab (FA, BIOL 3863)
____ BIOL 3863 General Ecology (SP, FA - 7 hours of biological sciences)
____ CSES 1203 Plant Science (SP, FA), CSES 2103 Crop Science (SP), **or** BIOL1613/1611L (SP, SU)
____ CSES 2013 Pest Management (SP)
____ CSES 2201L Soil Science Laboratory (FA, SP, pre or co-req CSES 2203)
____ CSES 2203 Soil Science (FA, SP, MATH 1203, CHEM 1103 or CHEM 1074)**
____ CSES 3214 Soil Resources and Nutrient Cycles with Laboratory (SP odd, CSES 2203, BIOL 2013)
____ CSES 355V Soil Profile Description (FA, 1 hour, may take twice for credit)
____ CSES 4013 Advanced Crop Science (FA, CSES 2103)
____ CSES 4133 Ecology and Morphology of Weedy and Invasive Species (FA, CSES 2103 (or HORT 2003) and CSES 2003).
____ CSES 4224 Soil Fertility with Laboratory (FA)
____ CSES 4253 Soil Classification and Genesis with Laboratory (FA odd, CSES 2203)
____ CSES 4253 Wetland Soils (SP odd, CSES 2203)
____ CSES 462V Internship
____ ENSC 3103 Plants and Environmental Restoration (FA, CSES 1203, BIOL 1613, or HORT 2003)
____ ENSC 3003 Introduction to Water Science (SP, MATH 1203, ENSC 1003 or other sci.)**
____ ENSC 3223 Ecosystem Assessment (FA even, BIOL 1543)
____ ENSC 3263 Soil and Water Conservation (FA)
____ ENSC 3603 GIS for Environmental Science (SP odd, CSES 2203)
____ ENSC 4021L Water Quality Laboratory (FA, CHEM 1123/1121L, BIOL 1543/1541L)
____ ENSC 4023 Water Quality (FA, pre or co-req ENSC 4023)
____ ENSC 4034 Analysis of Environmental Contaminants w/Lab (SP even, pre or co-req CHEM 2613)
____ ENSC 4263 Environmental Soil Science (SP even, CSES 3214, PHYS 2013)
____ ENSC 4401 Professional Certification (SP, junior or senior standing)
____ GEOS 3043 Sustaining Earth (SP, SU, FA - Junior standing)
____ GEOS 3543 Geographic Information Science (FA, SP, online)

** If not counted as Required Course

UNIVERSITY OF ARKANSAS
Dale Bumpers College of Agricultural, Food and Life Sciences
SOIL SCIENCE MINOR
2020-2021

* 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 to be comprised of the following required and optional courses. No more than 9 hours can be counted towards a Soil Science minor with an ESWS major. Note: 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 hours)

____ CSES 2203	Soil Science (SP, FA)
____ CSES 2201L	Soil Science Laboratory (SP, FA)

Optional Courses - select the remaining 14 hours from the following list of courses

Undergraduate Courses:

____ CSES 3214/3210L	Soil Resources and Nutrient Cycles with Laboratory (SP odd)
____ ENSC 3263	Soil & Water Conservation (FA)
____ CSES 355V	Soil Profile Description (FA, 1 hour, may take twice for credit)
____ CSES 4224/4220L	Soil Fertility with Laboratory (FA)
____ CSES 4253	Soil Classification and Genesis (FA odd)
____ ENSC 4263	Environmental Soil Science (SP even)
____ ENSC 4401	Professional Certification Preparation (Soils exam, SP even)
____ CSES 4553	Wetland Soils (SP odd)

Graduate Courses:

____ CSES 5033	Advanced Soil Fertility and Plant Nutrition (SP even)
CSES 5224/5220L	Soil Physics with Laboratory (SP)
____ CSES 5264/5260L	Microbial Ecology with Laboratory (FA odd)
____ CSES 5453	Soil Chemistry (SP even)

Approved: Student _____

Major Advisor _____

Minor Advisor _____

Date _____

Copies to: Student
Major Advisor
Minor Advisor
AFLS Dean's Office
Student's Dean's Office (if not AFLS)

UNIVERSITY OF ARKANSAS
Dale Bumpers College of Agricultural, Food and Life Sciences
CROP SCIENCE MINOR
2020-2021

* A student planning to minor in Crop Science must notify the program advisor for consultation and more detailed information.

The Crop Science Minor will consist of 18 Semester hours of 2000-level courses or above, including:
_____ CSES 2103 Crop Science (SP)
_____ CSES 2203 Soil Science (FA, SP, MATH 1203 and CHEM 1103 or CHEM 1073)

Remaining 12 semester hours to be selected from:
(at least two courses must be selected from Group A)

Group A
_____ CSES 3112 Forage Management (Irregular, CSES 1203 or CSES 2103)
_____ CSES 3312 Cotton Production (FA even, CSES 1203 or CSES 2103)
_____ CSES 3332 Rice Production (FA odd, CSES 1203 or CSES 2103)
_____ CSES 3342 Cereal Grain Production (SP even, CSES 1203 or CSES 2103)

Group B
_____ CSES 3214 Soil Resources and Nutrient Cycles (SP odd, CSES 2203 and BIOL 2013/2011L)
_____ CSES 4013 Advanced Crop Science (FA, CSES 2103)
_____ CSES 4103 Plant Breeding (FA even, ANSC 3123 or BIOL 2323)
_____ CSES 4133 Ecology and Morphology of Weedy & Invasive Plants (FA, CSES 2103 or HORT 2003)
_____ CSES 4143 Principles of Weed Control with lab (SP, CHEM 1073/1071L)
_____ CSES 4224 Soil Fertility with lab (FA, CSES 2203/2201L, CHEM 1123/1121L or 1073/1071L, & CHEM 2613/2611L)

Approved: Student _____

Major Advisor _____

Minor Advisor _____

Date _____

Copies to: Student
Major Advisor
Minor Advisor
Student's Dean's Office (if not AFLS)

UNIVERSITY OF ARKANSAS
Dale Bumpers College of Agricultural, Food and Life Sciences
CROP BIOTECHNOLOGY MINOR
2020-2021

* A student planning to minor in Crop Biotechnology must notify the program advisor for consultation and more detailed information.

The Crop Biotechnology Minor will consist of 16 semester hours of the following courses:

_____ BIOL 2323 General Genetics (SP, BIOL 1584 or BIOL 1543/1541L and (CHEM 1123/1121L or CHEM 1223/1121L) and (MATH 1203 or STAT 2023 or equivalent)) **or** ANSC/POSC 3123 Principles of Genetics (FA, BIOL 1543/1541L and MATH 1203)

_____ PLPA 4333 Biotechnology in Agriculture (FA)
_____ CSES 402V Special Topics (2 2-hour courses taken in two different semesters)

Choose 6 hours from the following:

_____ BIOL 4303 Plant Physiology (FA, BIOL 2533 or CHEM 3813 or CHEM 5843)
_____ CHEM 3813 Introduction to Biochemistry (SP, SU, FA, CHEM 3613/3611L or CHEM 3613H/3612M or CHEM 3713/3712L or CHEM 2613/2611L))
_____ CSES 4103 Plant Breeding (FA even, ANSC/POSC 3123 or BIOL 2323)

Approved: Student _____

Major Advisor _____

Minor Advisor _____

Date _____

Copies to: Student
Major Advisor
Minor Advisor
Student's Dean's Office (if not AFLS)

University of Arkansas
Dale Bumpers College of Agricultural, Food and Life Sciences
Pest Management Minor (PMGT-M)
2020-2021

* A student planning to minor in Pest Management must notify the program advisor for consultation and more detailed information.

The Pest Management Minor consists of a minimum of 19 hours to include two courses from each pest discipline; entomology (ENTO), plant pathology (PLPA), and weed science (CSES):

Required Courses:
_____ ENTO 3013 Introduction to Entomology (FA, suggested pre-req: BIOL 1543)
_____ PLPA 3004 Principles of Plant Pathology with lab (FA)

Select four (4) courses from the following:

_____ CSES 2003 Introduction to Weed Science (Irr, CSES 1203 or CSES 2103 or HORT 2003)
_____ CSES 4133 Ecology & Morphology of Weedy & Invasive Plants (FA, CSES 2103 or HORT 2003)
_____ CSES 4143 Principles of Weed Control (SP, CHEM 1073/1071L)
_____ ENTO 4123 Insect Pest Management (SP odd, ENTO 3013)
_____ ENTO 4133 Advanced Applied Entomology (SP even, ENTO 3013)
_____ PLPA 4223 Plant Disease Control (FA, PLPA 3004)
_____ PLPA 4304 Applied Plant Disease Management (Irr, PLPA 3004 or instructor consent)

Approved: Student _____

Major Advisor _____

Minor Advisor _____

Date _____

Copies to: Student
Major Advisor
Minor Advisor
Student's Dean's Office (if not AFLS)

University-wide Sustainability Minor
2020-2021

Hours	Courses
3	SUST 1103 Fundamentals of Sustainability (SP)
3	SUST 2103 Applications of Sustainability (FA) 3
	SUST 4103 Capstone Experience in Sustainability
	or substitute approved by UA Sustainability Curriculum Steering Committee
6	Tier 1 elective courses with sustainability focus
3	Tier 1 or 2 elective courses with sustainability focus
	Sustainability focused electives selected from list in 4 thematic areas:
	Social Systems
	Natural Systems
	Built Systems
	Managed Systems

To declare the Foundations of Sustainability minor, print the sustainability minor checklist or pick up a copy at the Office for Sustainability. Work with your major advisor to ensure you understand how it will fit into your degree plan, and meet with the Coordinator of Academic Sustainability, professor David Hyatt, to ensure you understand the requirements. Once the form is completed, please return it to Melinda Smith at melindas@uark.edu or in Vol Walker Hall.

Tier 1	**Prerequisite; Corequisite**:
CSES 3214 Soil Resources & Nutrient Cycles	CSES 2203, BIOL 2013; Corequisite: Lab component
ENSC 3003 Introduction to Water Science	MATH 1203 and ENSC 1003 or other science
ENSC 3103 Plants & Environmental Restoration	CSES 1203 or HORT 2003 or BIOL 1613
ENSC 3223/3221L Ecosystem Assessment	BIOL 1543; Corequisite: ENSC 3221L
ENSC 3263 Soil & Water Conservation	CSES 2203
ENSC 4023 Water Quality	BIOL 1543/1541L, CHEM 1123/1121L; Corequisite: Lab Component
ENSC 4263 Environmental Soil	CSES 3214, PHYS 2013
Tier 2	
CSES 2203/2201L Soil Science	CHEM 1103 or CHEM 1074
ENSC 1003 Environmental Science	None

All courses must be passed with a grade of 'C' or better in order to fulfill these requirements. A full list of courses applicable for the Sustainability minor can be found at http://sustainability.uark.edu/academics/minor/index.php.

Degree Requirements

(Information adapted from the University of Arkansas Catalog of Studies website)

University Graduation Requirements

- 120 semester hours of credit
- 35 hours University Core Courses. See check sheet for specific courses required.
- 2.00 GPA ("C" average) on all work attempted at the University of Arkansas.
- ≤68 semester hours of lower-division transfer course work (1000/2000 level).

Bumpers College Graduation Requirements

(Advising forms available at: https://bumperscollege.uark.edu/current-students/advising.php)

- 9 hours of Broadening electives (Bumpers College courses taken outside of ENSC).
- 36 hours of upper division course work (3000 level or above).
- 6 hours of Communications (COMM 1313 and CSES 3023 or AGED 3143).
- In addition to university and college requirements students must meet other defined departmental requirements specific to each major and concentration. Bumpers College courses outside of the major may be included in departmental requirements.
- Residency - All students must have a minimum residence requirement of 36 weeks and 30 semester hours. The senior year must be completed in residence on campus unless a senior has already met the minimum residency requirement. This student will be permitted to earn not more than 12 of the last 30 hours in extension or correspondence courses or in residence at another accredited institution granting the baccalaureate degree. No more than six of these 12 hours may be correspondence courses.

Rules Applying to Course Work Used for Degree Credit •

No credit will be given for duplicate coursework.

- A maximum of 6 hours of internship and 6 hours of special problems may be counted for degree credit.
- General electives may be used to meet the requirements for a minor.
- A total of 6 hours of elective credits in activity courses (PE, band, chorus, judging teams, debate, drama, athletics, etc.) may be counted toward a degree. The maximum elective credits in any one activity that may be counted toward a degree are as follows:

Band and/or chorus	4 hours
Drama and/or debate	4 hours
Judging teams	4 hours
Physical education activities	4 hours

- Any course taken by correspondence, including Web-based courses, must be approved in advance in the AFLS dean's office if the credits earned in the course are to be applied toward a degree. This rule applies regardless of the school from which the course is taken.

- All transfer course work to be applied toward the degree must be an approved course listed in the transfer equivalency guide maintained by the Registrar's office. For courses not listed in the guide, petitions can be submitted to the Dean's office by the student's academic adviser.
- All study abroad courses must be approved in advance in the Dean's office if the credits earned in the courses are to be applied toward a degree.

Requirements to Graduate with Honors Designation and/or Honors Distinction

Honors Designation

Students who have demonstrated exceptional academic performance in baccalaureate degree programs will be recognized at graduation by the honors designation of *Cum Laude, Magna Cum Laude*, or *Summa Cum Laude*. To earn these, a student must meet the following criteria:

- At least one-half of the degree course work must have been completed at the University of Arkansas, Fayetteville.
- Only the grade-point average on course work completed at the University of Arkansas, Fayetteville, will be considered.
- Must successfully complete the Bumpers College Honors Program, which includes a minimum of 9-12 hours of honors course work, 3-6 hours of honors thesis, and a completed honors capstone research or creative project culminating in a written thesis documenting the project.
- For each of the three honors designations, the student must have the minimum gradepoint average indicated. *Cum Laude*: 3.50 to 3.74

  Magna Cum Laude: 3.75 to 3.89 *Summa Cum Laude*: 3.90 to 4.00

  • Students who do not participate in the AFLS Honors Program but earn the above grade-point averages will graduate "with distinction", "with high distinction", and

  "with highest distinction", respectively.

The AFLS Honors Program

Mission Statement – The mission of the AFLS Honors Program is to provide undergraduate students with opportunities beyond the traditional undergraduate experience.

- Students who enter the University with a High School GPA of 3.5 and an ACT of 28 or who transfer in with a cumulative college GPA of 3.5 (< 62 credit hrs) are eligible to join the AFLS Honors Program and graduate with Honors Designation.

Benefits of the AFLS Honors Program

- Enhance opportunities for admission to graduate and professional schools
- Opportunity to work directly with faculty mentors on their research/creative projects culminating in their honors thesis
- Specialized honors courses
- Opportunity to receive stipends to support thesis projects and study abroad opportunities
- Opportunities to publish results and present findings at scientific or professional meetings

- Advanced course pre-enrollment
- Opportunity for special housing in the Honors Quarters
- Special recognition at the College commencement ceremony

For additional information and to apply for admission to the program visit the AFLS Honors Program website (https://bumpershonors.uark.edu).

AFLS Grading System

The Dale Bumpers College of Agricultural, Food and Life Sciences utilizes a plus/minus grading system that assigns numerical values to 12 different grades. These values are used for courses when grade-point averages are calculated. See Grades and Marks for the method of calculating grade-point averages. The 12-step grading system with assigned values is as follows:

	A 4.00	A-.....3.67
B+.....3.33	B 3.00	B-.....2.67
C+.....2.33	C 2.00	C-.....1.67
D+.....1.33	D 1.00	D-.....0.67
	F 0.00	

Resources Available

There are many resources on campus available to assist students in overcoming personal obstacles and achieving success while at the University of Arkansas. While the goal is for students to take control of their college experience, departmental, college, and university personnel are here to provide guidance, offer advice, ask questions, make suggestions and recommendations, provide referrals, and above all, inform students of the many opportunities available to them. Students are encouraged to ask advisors about university resources and how to find them. Academic advisor contact information should be available in your Student Center in UA Connect. Students will also learn about many of those resources in their freshmen orientation course, UNIV 1001 University Perspectives.

If you would rather speak to someone outside the department, feel free to contact Vicky Watkins, Retention and Curriculum Coordinator, in the Bumpers College Dean's Office at 479-575-2121, email watkinsv@uark.edu, or schedule an appointment with Ms. Watkins in UA Success.

University academic support resources are consolidated under the Center for Learning and

Student Success (**CLASS+**) +Tutoring, +Writing Support, +Supplemental Instruction, +Academic Coaching, located at class.uark.edu, 479-575-2885, or you can visit the office in lower level of Gregson Hall. The entrance to the CLASS+ office is on the south side of Gregson Hall, down the stairs behind the UA bus stop.

In addition, students can also receive assistance by contacting **CAPs** (Counseling and Psychological Services) at Pat Walker Health Center on the corner of Maple and Garland. Schedule an appointment by calling 479-575-5276. For additional information, visit the CAPs website at: http://health.uark.edu/counseling/index.php.

The Division of Student Affairs will also connect students to appropriate resources to overcome personal and education barriers. Find out more and/or for a referral, please visit https://uofacares.uark.edu/.

Scholarships for Department of Crop, Soil, and Environmental Sciences

Scholarships available to CSES students are made possible by generous gifts from many firms and individuals. The criteria for these scholarships include academics, majors and minors, interests, financial need, and extracurricular activities. The Bumpers Scholarship Application (which is also the University of Arkansas universal application for current students) makes one eligible for many of these scholarships. There are some scholarships that require additional applications; these are listed under Special Applications. For many academic years, approximately $100,000 has been awarded to deserving undergraduates. For additional information contact Dr. Kristofor Brye, CSES Scholarship Coordinator (kbrye@uark.edu; 479-575-5742). A link to the scholarship application that is due each year will be available through the college's scholarship webpage https://bumperscollege.uark.edu/future-students/scholarships.php.
Check the college web site for application due date (usually beginning of February).

The updated list of scholarships is available at the college webpage at https://bumperscollege.uark.edu/future-students/scholarships.php

Other Scholarships to Consider Applying for

American Society of Agronomy - Several scholarships available to a variety of recipients. Information is available at: https://www.agronomy.org/students/

Arkansas Alumni Association - Several scholarships available to a variety of recipients. Information is available at: http://arkalum.org/scholarships/

Arkansas Association of Professional Soil Classifiers - Deadline is usually October/November. http://www.accessarkansas.org/soilclassifiers/index.htm

Arkansas Academic Challenge Scholarship - Scholarship information is available at http://www.adhe.edu

Arkansas Farm Bureau Scholarship - Jr or Sr; Arkansas resident; enrolled in an Arkansas accredited college or university; actively pursuing an ag-related degree. Scholarship based upon academic achievement, character, career plans, financial need and leadership potential. Must maintain a 2.5 GPA. Information is available at:

http://www.arfb.com/programs/scholarship.asp

Arkansas Game and Fish Commission - Arkansas high school Sr or Arkansas college undergraduate pursuing a career in the field of natural resources conservation with a 2.5 cumulative GPA (4.0 scale). Applicants must not have received a full scholarship from another source. Information is available at: http://www.agfc.com/educationclass/programs/conservation-scholarship-program.aspx

Arkansas Society of Professional Sanitarians - So; Arkansas resident; enrolled in an environmental field. Deadline usually in March or April. Information is available at: http://www.arkansassanitarians.org/scholarship.php

Arkansas Environmental Federation Randall Mathis Scholarship for Environmental Studies and Larry Wilson Scholarship for Environmental Studies - Deadline is usually January. Information is available at: http://www.environmentark.org/scholarships.html

Garden Club of America - Numerous scholarships available with deadlines ranging from November through February. Information is available at: http://gcamerica.org/scholarships.php3

Mark and Theresa Gentry Land and Water Scholarship - Undergraduate and graduate students of the University of Arkansas, Fayetteville, who are studying land and water resources management, or related areas. Application forms are available at the Arkansas Water Resources Center, 112 Ozark Hall, University of Arkansas, Fayetteville, Arkansas, 72701, (479) 575-5867, by e-mailing awrc@uark.edu. Deadline is typically February. Information is available at: http://www.uark.edu/depts/awrc/scholarships.html

Razorback Chapter Soil and Water Conservation Scholarship (NRCS) - Contact: brent.clark@ar.usda.gov

Soil and Water Conservation Scholarships - Deadline is typically February. Additional information available at: http://www.swcs.org/en/members_only/scholarships/

University of Arkansas University-Wide Scholarship - UA students from any academic discipline. Must have completed at least one fall semester. High level of academic achievement coupled with leadership qualities, financial need, or have achieved academic success despite significant adversity. Deadline is typically February. Information is available at: http://scholarships.uark.edu/index.php/csschl/default **Nonresident Tuition Award** - Out-of-state tuition differential for students from TX, MS, LA, KS, MO, OK, TN.

Internship Opportunities in Crop, Soil, and Environmental Science (CSES 462V)

The internship program is based upon the principle that what students learn in the workplace can be a valuable supplement to what they learn in the classroom. By combining work and study, students gain greater insight into each and may be better prepared for employment in their chosen careers. The CSES internship is designed to fit needs of the individual student, but for full credit the student must meet minimal requirements listed below. In cooperation with an employer, the course will be supervised by an internship committee.

Enrollment in the internship course (CSES 462V) is by instructor consent only. Therefore, any student wishing to enroll in the internship class must contact one of the internship committee members listed below for a copy of all current requirements and approval to enroll.

Internship Committee

Crop Science - Dr. L.C. Purcell (Altheimer Laboratory 302; 575-3983)

Weed Science - Dr. J.K. Norsworthy (Altheimer Laboratory 302; 575-8740) **Soil Science/Environmental Science** - Dr. K.R. Brye (Agriculture 123; 575-5742)

Requirements for academic credit:

1. Learning objectives for an internship project will be initially agreed upon by a CSES internship committee, an employer (sponsor), and the student. A written pre-proposal is required to initiate the internship and must be approved by the committee. The pre-proposal should include the following:

Internship Pre-proposal Format *(due prior to enrolling in CSES 462V)*

A. **Title:** A brief, clear, specific designation of the subject.

B. **Submitted By:** List full name, summer address and phone number where you can be contacted.

C. **Company Sponsor:** List company's full name, immediate supervisor's name, address, and phone number.

D. **Date of Submission to Committee:** During priority enrollment

E. **Dates of Internship:** Starting and ending dates

F. **Credit Hours:** List the number of semester hours of credit for which you are enrolling (generally 1 to 3 hours).

Only after the pre-proposal has been approved by the committee can the student be enrolled in CSES 462V. If the student will not complete all of the requirements prior to the end of a term (Spring/Fall/Summer), the student may postpone enrolling in the internship until the following term. There is a required workshop in the spring semester to learn about expectations and requirements to fulfill internship credit.

2. After the project is approved by the internship committee, the student will be directly responsible to one instructor who is a member of that committee. The student must submit a full proposal to the instructor two weeks after beginning employment. An outline to follow for the proposal format is available from the instructors.
3. Upon completion of the internship employment, the student must submit a final written report to the instructor. This report will be distributed to the internship committee for review and evaluation. The final report will follow the same format as the proposal.
4. In addition to the final written report, the student will make an oral presentation which summarizes his or her internship to an orientation (FYE) course, CSES Seminar, the internship committee, or other audiences.
5. At the conclusion of the internship, the internship instructor will contact the employer to discuss the employer's evaluation of the student's accomplishments during the internship
6. The internship committee will evaluate the student's performance and determine the letter grade for the course based upon fulfillment of these requirements, the initial

agreement relative to the proposal, and performance throughout the project. The semester credit hours available for internship are generally 1 - 3 credit hours.

Study Abroad Opportunities

The International Programs are specifically tailored to meet the individual needs of each student (http://bumperscollege.uark.edu/internationalprograms/index.php). Programs include internships, semester or year abroad study, and faculty-led study tours (see page 25 for study tour led by CSES faculty). Students have participated in a variety of programs.

Internships

Lengths of internships vary but usually involve six to twelve weeks. These may be prearranged independent studies or working internships directed by faculty at the University of Arkansas in cooperation with a university or agency.

Semester

Longer programs are designed to give students a full semester of study abroad in their field of interest and in the country of choice. Students enroll for UA study abroad credit, and the courses transfer to the University of Arkansas. Planning in advance with their advisor allows students to build a strong academic transcript.

Year

This option is essentially the same as the semester option, in which courses taken abroad may be transferred back to the University of Arkansas. Special planning is required so that all credit hours earned abroad are transferable to the student's degree program.

Study Visits and Tours

Individualized and group study visits for two to four weeks are sometimes arranged for one student or a group of students, coordinated by various faculty. Specific student responsibilities are planned in advance with the University of Arkansas faculty advisor to complement the student's field of study and to earn academic credit.

Two study tours specific for CSES students are:

AFLS 401V-3, AFLS 401VH-3, and AFLS 501V-3 India – Merging Diverse Traditions into Modern Life) Faculty led study tour in northern India to help students develop global perspective and cultural understanding, specifically of Indian agriculture and its challenges. *Instructors: Vibha Srivastava and Mary Savin*

AFLS 401V-3/AFLS 401VH-3, and GENG 3113 Belgium - Sustainability in the Euro Food System (May intersession) Exposure to sustainability concepts in terms of water, soil, and energy needs for food, fiber, and feed production. Understanding the layout of Agrofood supply chain. Analysis of food processing unit operations and of strategies to new product development in Europe. System analysis of inputs and outputs of energy, water and mass for the purpose of producing and processing biomass for human uses. In country experience at the University of Gent, Gent, Belgium. *Instructors: Mary Savin and Benjamin Runkle*

Student Study Lounge

Computer and printer access in room 113 Plant Science; location for small groups to meet; for use by students in the Department of Crop, Soil, and Environmental Sciences.

Employment Opportunities

Students in the CSES Department are encouraged to fill out an employment application in the CSES main office (Plant Science 115). These applications are kept on file for faculty and staff to review when they are looking for student workers.

Undergraduate Activities within the CSES Department

CSES Undergraduate Club

All undergraduate students in the department are encouraged to participate in the CSES Undergraduate Club. The group meets at least once per month, but often schedules extra activities when members have special requests. Club members enjoy academic, social, and service oriented opportunities to interact with fellow students. Past club activities have included: guest speakers, canoe trips, assisting in the cleanup and design of a local wetland/park and streams, working with middle school children in a school garden and designing QR codes with background information for the garden. For more information contact a club officer or advisor.

CSES Club Officers 2021

President: Ashley Smith, ashns@uark.edu
Vice President: Avery Blair, aeblair@uark.edu
Secretary: Chandler Arel, cmarel@uark.edu
Treasurer: Connor Pearson, scpearso@uark.edu

Dr. Mary Savin (Office: AGRI 105B; Phone: 479-575-5740; msavin@uark.edu)
Dr. Lisa Wood (Office: AGRI 105A; Phone: 479-575-5739; lswood@uark.edu)

CSES Soil Judging Team

Each fall semester, members of the CSES Soil Judging Team meet once per week to practice for the regional soil judging competition held in October. No previous experience is necessary and you can enroll in the CSES 355v Soil Profile Description course for 1-hour credit. For more information, contact Dr. Kristofor Brye (kbrye@uark.edu; 479-575-5742).

CSES Personnel of Interest and Department Committees

Office Personnel (Plant Science 115)

Ms. Daniela Kidd (575-2354; drkidd@uark.edu)
Ms. Ramisa Fairooz (575-6692; rfairooz@uark.edu)
Mr. Scott Mattke (575-2749; smattke@uark.edu)
Ms. Shauna Weseman (575-5718; swesema@uark.edu)

Undergraduate Recruiter
Ms. Holly Yeatman (Office: PTSC 120; Phone: 479-575-5726; hyeatman@uark.edu)

Faculty Committees of Interest
Assessment Committee - Dr. Mary Savin (575-5740; msavin@uark.edu)
Awards Committee – Dr. Jason Norsworthy (575-8740; jnorswor@uark.edu) and Jason Kelley (jkelley@uaex.edu)
Curriculum Committee - Dr. Mary Savin (575-5740; msavin@uark.edu)
(CSES Undergraduate Club President is a committee member.)
Honors Committee - Dr. Lisa Wood (575-8671; lswood@uark.edu)
Recruitment Committee - Ms. Holly Yeatman (575-5726; hyeatman@uark.edu)
Undergraduate Committee - Dr. Lisa Wood (575-8671; lswood@uark.edu)

Undergraduate Courses in AFLS (AFLS)

AFLS 401V-3, AFLS 401VH-3, and AFLS 501V-3 Merging Diverse Traditions into Modern Life (Jan intersession) Faculty led study tour in northern India to help students develop global perspective and cultural understanding, specifically of Indian agriculture and its challenges.
Instructors: Vibha Srivastava and Mary Savin

AFLS 401V-3/AFLS 401VH-3, and GENG 3113 Sustainability in the Euro Food System (May intersession) Exposure to sustainability concepts in terms of water, soil, and energy needs for food, fiber, and feed production. Understanding the layout of Agrofood supply chain. Analysis of food processing unit operations and of strategies to new product development in Europe. System analysis of inputs and outputs of energy, water and mass for the purpose of producing and processing biomass for human uses. In country experience at the University of Gent, Gent, Belgium.
Instructors: Mary Savin and Benjamin Runkle

Undergraduate Courses in Environmental Science (ENSC)

ENSC 1001L Environmental Science Laboratory (Fa, Sp) 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. Prerequisite or Corequisite: ENSC 1003 *Instructor: Lisa Wood*

ENSC 1003 Environmental Science (Fa, Sp) Series of lectures and discussions introducing the topic of environmental science including factors related to water, soil, and air quality. (Natural science university core course with laboratory) *Instructor: Lisa Wood* **ENSC 3003 Introduction to Water Science** (Sp) 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 GEOL 1113 or higher or BIOL 1543. *Instructor: Kristofor Brye*

ENSC 3103 Plants and Environmental Restoration (Even years, Fa) 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. Service Learning course; Prerequisite: CSES 1203 or HORT 2003 or BIOL 1613.

Instructor: Lisa Wood

ENSC 3221L Ecosystems Assessment Laboratory (Even years, Fa) 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. *Instructor: Mary Savin*

ENSC 3223 Ecosystems Assessment (Even years, Fa) Applications of the basic ecological principles of organisms, populations, communities, and ecosystems to gain an appreciation for how large scale patterns in terrestrial and aquatic ecosystems are influenced by small scale interactions among individuals (microorganisms to invertebrate macrofauna) and between individuals and their local environment. Lecture 3 hours per week. Corequisite: ENSC 3221L. Prerequisite: BIOL 1543. *Instructor: Mary Savin*

ENSC 3263 Soil and Water Conservation (Even years, Fa) 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. *Instructor: Kristofor Brye*

ENSC 3413 Principles of Environmental Economics (Sp) 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. (Same as AGEC 3413) *Instructor: Kent Kovacs*

ENSC 3603 GIS for Environmental Science (Odd Years, Sp) 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.

Instructor: Vaughn Skinner

ENSC 3933 Environmental Ethics (Sp) 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/week. Prerequisite: ENSC

1003 or PHIL 2003 or PHIL 2103. *Instructor: David Miller* **ENSC 400V Special Problems** (Sp, Su, Fa) (1-3) Work on special problems in environmental science or related fields. May be repeated for up to 6 hours of degree credit. *Instructor: Faculty*

ENSC 4021L Water Quality Laboratory (Fa) 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. *Instructor: Faculty*

ENSC 4023 Water Quality (Fa) 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. Laboratory experiments in water sampling, measurement of water quality parameters, and instrumentation. Prerequisite: CHEM 1123 and CHEM 1121L. *Instructor: Faculty*

ENSC 4034 Analysis of Environmental Contaminants (Even years, Sp) 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. Prerequisite: CHEM 2613/2611L or CHEM 3603/3601L. *Instructor: Mary Savin*

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

ENSC 4263 Environmental Soil Science (Even years, Sp) 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. Prerequisite: CSES 3214. *Instructor: Lisa Wood*

ENSC 4401 Professional Certification Preparation (Sp) Concepts and skills already learned in other soil and environmental science and related courses are reinforced with 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.
Instructor: Mary Savin

Undergraduate Courses in Crop, Soil, and Environmental Sciences (CSES)

CSES 1203 Introduction to Plant Sciences (Sp, Fa) An introduction to basics of agricultural crop plant structure, growth, and production. (Same as HORT 1203) *Instructor: Lisa Wood*

CSES 2013 Pest Management (Ir) 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. *Instructor: Team taught*

CSES 2101L Crop Science Laboratory (Sp) 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. *Instructor: TBD*

CSES 2103 Crop Science (Sp) 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. *Instructor: TBD*

CSES 2201L Soil Science Laboratory (Fa, Sp) 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. *Instructor: Dave Miller*

CSES 2203 Soil Science (Fa, Sp) Origin, classification, and physical, chemical, and biological properties of soils. Lecture 3 hours, discussion 1 hour per week. Corequisite: Drill component. Prerequisite: CHEM 1103 or CHEM 1074. *Instructor: Dave Miller*

CSES 3023 Crop, Soil, and Environmental Sciences Colloquium (Fa) A communicationintensive 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. Colloquium workshop: 3 hours per week. Prerequisite: Junior or Senior standing only. *Instructor: Mary Savin*

CSES 3113 Forage Management (Irregular) Forage crops for pasture, hay, and silage with reference to growth and development, production, nutritional quality, and grazing systems. Lecture 3 hours per week. Prerequisite: CSES 1203 or CSES 2103 or HORT 1203. *Instructor: TBD*

CSES 3214 Soil Resources and Nutrient Cycles (Odd years, Sp) 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. Corequisite: Lab component. Prerequisite: CSES 2203/2011L, BIOL 2013/2011L. *Instructor: Mary Savin*

CSES 3312 Cotton Production (Even years, Fa) Principles and techniques associated with production of cotton. Recitation 2 hours per week. Prerequisite: CSES 1203 or CSES 2103 or HORT 1203. *Instructor: Faculty*

CSES 3322 Soybean Production (Odd years, Sp) 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 or HORT 1203. *Instructor: Larry Purcell*

CSES 3332 Rice Production (Odd years, Fa) 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 or HORT 1203. *Instructor: Rick Norman*

CSES 3342 Cereal Grain Production (Even years, Sp) An overview of the botany, production, cultural practices, soil & climatic adaptation and utilization of the major cereal grains. Prerequisite: CSES 1203 or CSES 2103 or HORT 1203. *Instructor: Esten Mason* **CSES 355V Soil Profile Description** (Fa) (1, may be repeated) Training for soil profile description writing and membership of judging teams. May be repeated for up to 2 hours of degree credit.

Instructor: Kristofor Brye

CSES 3603 Metrics for Sustainable Agriculture (Fa) 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. *Instructor: Marty Matlock*

CSES 400V Special Problems (Sp, Su, Fa) (1-6) Work on special problems in crop, soil and environmental sciences or related field. May be repeated for up to 6 hours of degree credit.

Instructor: Faculty

CSES 4013 Advanced Crop Science (Sp) Fundamental concepts of crop physiology, crop improvement, seed science, and crop production systems. Recitation 3 hours per week. Prerequisite: CSES 2103. *Instructor: Team taught*

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

CSES 4103 Plant Breeding (Even years, Fa) 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. *Instructor: Esten Mason*

CSES 4133 Ecology and Morphology of Weedy and Invasive Species (Fa) 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). *Instructor: Nilda Burgos*

CSES 4143 Principles of Weed Control (Sp) 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 and CSES 2003. *Instructor: Jason Norsworthy*

CSES 4224 Soil Fertility (Fa) 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. Corequisite: Lab component. Prerequisite: CSES 2201L and CSES 2203 and CHEM 1123/1121L or CHEM 1073/1071L and CHEM 2613/2611L. *Instructor: Trent Roberts* **CSES 4253 Soil Classification and Genesis** (Odd years, Fa) 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 2203/2201L. *Instructor: Kristofor Brye*

CSES 4303 Bioenergy Feedstock Production (Sp) 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. Prerequisites MATH1203 and BIOL1543 or CSES1203. Courses in introductory chemistry or soil science are preferred. Online course
Instructor: TBD

CSES 4553 Wetland Soils (Odd years, Sp) Focus on wetlands and wetland soils from a jurisdictional rather than ecological standpoint. Topics include wetland hydrology, hydric soil determination, and principles of wetland identification and delineation. Field emphasis, meets 3 hours once per week (Pre-requisites: CSES 2203/2201L). *Instructor: Lisa Wood*

CSES 462V Internship (Sp, Su, Fa) (1-6 hrs credit) Supervised practical work experience in crop management 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: junior standing. May be repeated for up to 6 hours of degree credit. *Instructors: Kris Brye, Jason Norsworthy, and Larry Purcell*

Teaching Faculty in the Department of Crop, Soil, and Environmental Sciences

Kristofor Brye (Office: AGRI 123; Phone: 479-575-5742; kbrye@uark.edu)
Professor of Applied Soil Physics and Pedology (Ph.D. University of Wisconsin, Madison)
Teaches: CSES 355V Soil Profile Description (Fa) (1-2 hrs credit); CSES 2203 Soil Science (Sp); CSES 4253 Soil Classification and Genesis (Fa, odd); CSES 4013 Advanced Crop Science (Sp); CSES 462V Internship (Sp, Su, Fa) (1-6 hrs credit); ENSC 3003 Introduction to Water Science (Sp); ENSC 3263 Soil and Water Conservation (Fa, even)

Nilda R. Burgos (Office: ALTH 222; Phone: 479-575-3984; nburgos@uark.edu)
Professor of Weed Science (Ph.D. University of Arkansas)
Teaches: CSES 4013 Advanced Crop Science (Sp); CSES 4133 Ecology and Morphology of Weedy and Invasive Plant Species (Fa)

David M. Miller (Office: AGRI 106; Phone: 479-575-5747; dmmiller@uark.edu)
Professor of Soil Chemistry (Ph.D. University of Georgia)
Teaches: CSES 2203 Soil Science (Fa, Sp); CSES 2201L Soil Science Laboratory (Fa, Sp); ENSC 3933 Environmental Ethics (Odd years, Sp)

Leandro Mozzoni (Office: PTSC 105; Phone: 479-575-7564; lmozzon@uark.edu)
Associate Professor of Soybean Breeding and Genetics (Ph.D. University of Arkansas)

Jason Norsworthy (Office: ALTH 302; Phone: 479-575- 8740; jnorswor@uark.edu)
Professor of Weed Science (Ph.D. University of Arkansas)
Teaches: CSES 2013 Pest Management (Sp); CSES 4143 Principles of Weed Control (Sp); CSES 462V Internship (Sp, Su, Fa) (1-6 hrs credit)

Andy Pereira (Office: PTSC 112; Phone: 479-575-8435; apereira@uark.edu)
Professor, Anheuser-Busch and Arkansas Wholesalers Professorship in Plant Molecular Genetics (Ph.D. Iowa State University, Plant Molecular Genetics) Teaches:
CSES 5543 Genomics (Even Years, Sp)

Larry C. Purcell (Office: ALTH 302; Phone: 479-575-3983; lpurcell@uark.edu) Professor and Altheimer Chair for Soybean Research (Ph.D. University of Florida)
Teaches: CSES 3322 Soybean Production (Odd years, Sp); CSES 462V Internship (Sp, Su, Fa) (1-6 hrs credit)

Trenton Roberts (Office: ALTH; Phone: 479-575-6752; tlrobert@uark.edu) Research Assistant Professor (Ph.D. University of Arkansas, Soil Fertility)
Teaches: CSES 4224 Soil Fertility (Fa), CSES 4013 Advanced Crop Science (Sp)

Mary Savin (Office: AGRI 105B; Phone: 479-575-5740; msavin@uark.edu)
Professor of Soil Biology and Microbial Ecology (Ph.D. University of Rhode Island)
Teaches: AFLS 401V-3, AFLS 401VH-3, and AFLS 501V-3 Merging Diverse Traditions

into Modern Life (Jan intersession); AFLS 401V-3, AFLS 401VH-3, and GENG 3113 Sustainability in the Euro Food System (May intersession); CSES 3023 Crop, Soil, and Environmental Sciences Colloquium (Fa); CSES 3214 Soil Resources and Nutrient Cycles with Laboratory (Odd years, Sp); ENSC 3223/3221L Ecosystems Assessment with Laboratory (Even years, Fa); ENSC 4034 Analysis of Environmental Contaminants with Laboratory (Even years, Sp); ENSC 4401 Preparation for Professional Certification (Sp)

Vaughn Skinner (Office: Farm; Phone: 479-575-5479; jskinner@uark.edu)
Resident Director, Agricultural Research & Extension Center (Ph.D. University of Arkansas)
Teaches: ENSC 3603 GIS for Environmental Science (Odd Years, Sp)

Vibha Srivastava (Office: PTSC 109; Phone: 479-575-4872; vibhas@uark.edu)
Professor of Plant Tissue Culture and Transformation (Ph.D. Jawaharlal Nehru University, New Delhi)
Teaches: AFLS 401V-3, AFLS 401VH-3, and AFLS 501V-3 Merging Diverse Traditions into Modern Life (Jan intersession) Crop Biotechnology minor advisor

Lisa Wood (Office: AGRI 105A; Phone: 479-575-5739; lswood@uark.edu)
Clinical Assistant Professor of Soil and Environmental Science (Ph.D. University of Arkansas)
Teaches: ENSC 1003/1001L Environmental Science and Laboratory (Fa, Sp); ENSC 3103 Plants and Environmental Restoration (Fa); ENSC 4263 Environmental Soil Science (Even, Sp); CSES 1203 Introduction to Plant Science (Fa, Sp); CSES 4553 Wetland Soils (Odd, Sp)

Organizational Chart of the ESWS Student