

# Crop, Soil and Environmental Sciences (CSES)

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Crop, Soil and Environmental Sciences Website (<http://cses.uark.edu/>)

## Degrees Conferred:

M.S., Ph.D. (CSES)

**Areas of Study:** Crop sciences, soil sciences, and environmental sciences. Areas of specialization within these concentrations include plant breeding and genetics, biotechnology, water quality, environmental science, crop physiology, crop production, weed science, pesticide residue, seed technology, soil chemistry, soil classification, soil fertility, soil microbiology, and soil physics.

**Primary Areas of Faculty Research:** Environmental, soil, and water science (bioremediation, soil and water quality, microbial ecology, nutrient management, natural resource management using GIS); plant sciences (plant breeding and genetics, plant biotechnology, plant physiology, weed science), and agronomic production science.

**Prerequisites to Degree Programs:** While extensive undergraduate training in agriculture and physical and biological science is desirable, no specific prerequisites are required. Deficiencies in undergraduate major or prerequisites for advanced courses may be included in the student's program.

## M.S. in Crop, Soil and Environmental Science

### Requirements for the Master of Science Degree:

Minimum of 24 semester hours of course work as outlined by the student's graduate advisory committee plus six semester hours of thesis credit. The student will be given an oral examination after the thesis is completed.

Students should also be aware of Graduate School requirements with regard to master's degrees (<http://catalog.uark.edu/graduatecatalog/degree requirements/#mastersdegree text>).

## Ph.D. in Crop, Soil and Environmental Science

**Requirements for the Doctor of Philosophy Degree:** After a student has been admitted to the Graduate School and accepted by the department as being qualified for advanced work, the student is assigned to a major adviser. The major adviser will, in consultation with the department head, select a graduate committee. This committee will serve both in an advisory capacity for the student's program and as the dissertation and examination committee. The student's graduate advisory committee will determine the number of hours of course work to be completed for the degree.

The student must take candidacy examinations (prelims) in at least five fields of study after completing approximately two years of graduate

study and at least one year before completing all other requirements. Preliminary examinations must be written and oral. Further details regarding requirements for the Doctor of Philosophy degree are available in the department office.

Students should also be aware of Graduate School requirements with regard to doctoral degrees (<http://catalog.uark.edu/graduatecatalog/degree requirements/#phdandeddgreestext>).

## Graduate Faculty

**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.

**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.

**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.

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

**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.

**Roberts, Trenton L.**, Ph.D. (University of Arkansas), M.S. (University of Arizona), B.S. (Oklahoma State University), Associate Professor, 2010, 2022.

**Ross, Jeremy**, Ph.D., M.S., B.S. (University of Arkansas), Professor, 1996, 2017.

**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.

**Skinner, Jerral V.**, Ph.D. (University of Arkansas), Lecturer, 1990.

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

**Speir, Shannon**, Ph.D. (University of Notre Dame), M.S. (University of Arkansas), B.S. (Texas Christian University), Assistant Professor, 2022.

**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.

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

## Courses

### **CSES 50001. Weed Science Practicum. 1 Hour.**

Training for membership on weed team, through participation. Prerequisite: Graduate standing. (Typically offered: Summer)

### **CSES 50103. Crop Physiology. 3 Hours.**

Understanding and quantitative measurement of physiological processes, plant responses, and environmental parameters in relation to the production of crops. (Typically offered: Spring Even Years)

### **CSES 50203. Physiology of Herbicide and Plant Interaction. 3 Hours.**

The reproduction, growth, and development of weeds and the ecological factors affecting these processes; development and mechanisms of herbicide resistance, flow of herbicide-resistance genes; and development of herbicide-resistant crops. Corequisite: Lab component. Prerequisite: CSES 41403 or CSES 51403 (formerly CSES 41403) and CHEM 58103. (Typically offered: Spring Odd Years)

### **CSES 5023V. Graduate Special Problems. 1-6 Hour.**

Original investigations on assigned problems in agronomy or graduate teaching practicum. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer)

### **CSES 50303. Advanced Soil Fertility and Plant Nutrition. 3 Hours.**

Study of water uptake, ion absorption, translocation and metabolism in higher plants. Lecture 3 hours per week. Prerequisite: CHEM 26103 and CHEM 26101. (Typically offered: Spring Even Years)

### **CSES 5040V. Special Topics. 1-4 Hour.**

Topics not covered in other courses or a more intensive study of specific topics in agronomy. Prerequisite: Graduate standing. (Typically offered: Irregular) May be repeated for degree credit.

### **CSES 50703. Advanced Crop Science. 3 Hours.**

Fundamental concepts of crop physiology, crop improvement, seed science, and crop production systems. Recitation 3 hours per week. Graduate degree credit will not be given for both CSES 40133 and CSES 50703. (Typically offered: Fall)

### **CSES 50803. The Business of Plant Breeding. 3 Hours.**

Students will gain knowledge and develop skills in five areas central to successful execution of plant breeding in private and public environments: 1) breeding industry, 2) breeding goals, new product development and marketing, 3) breeding budgets and finance, 4) regulations of the breeding industry, and 5) leadership basics. (Typically offered: Fall Odd Years)

### **CSES 50903. Plant Breeding. 3 Hours.**

This course aims to provide students with an extensive background in plant breeding applied to cultivar development, including but not limited to understanding the foundations of plant breeding, modes of reproduction in plants, various breeding methods, and introduction to quantitative genetics. Graduate degree credit will not be given for both CSES 41003 and CSES 50903. Prerequisite: ANSC 31203 or BIOL 23373. (Typically offered: Fall)

### **CSES 51003. Scientific Presentations. 3 Hours.**

Experience in procedures required for professional presentations of scientific papers, seminars, posters; and research findings at meetings in conferences, and with discussion groups. Instruction in organization of materials, visual aids, and good speaking habits. Lecture 3 hours per week. Prerequisite: Graduate standing. (Typically offered: Fall)

### **CSES 51104. 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. Graduate degree credit will not be given for both CSES 42204 and CSES 51104. Corequisite: Lab component. (Typically offered: Fall)

### **CSES 51303. 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. Graduate degree credit will not be given for both CSES 41303 and CSES 51303. Corequisite: Lab component. Prerequisite: CSES 21033 or HORT 20003. (Typically offered: Fall)

### **CSES 51403. 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. Graduate degree credit will not be given for both CSES 41403 and CSES 51403. Corequisite: Lab component. Prerequisite: CHEM 12103 and CHEM 12101. (Typically offered: Spring)

### **CSES 52104. Analytical Research Techniques in Agronomy. 4 Hours.**

Preparation and analysis of plant and soil samples utilizing spectrophotometry, isotopes, and chromatographic separation methods. Additionally, measurements are made of photosyntheses, respiration, water relationships, light, and temperatures in whole plants. Lecture 2 hours, laboratory 4 hours per week. Corequisite: Lab component. Prerequisite: CHEM 26103 and CHEM 26101. (Typically offered: Fall Even Years)

### **CSES 52204. Soil Physics. 4 Hours.**

Physical properties of soils and their relation to other soil properties, growth of plants and transport of water, oxygen, heat, and solutes such as pesticides and plant nutrients. Lecture 3 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: CSES 22003 and MATH 11003. (Typically offered: Spring)

### **CSES 52503. 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. Graduate degree credit will not be given for both CSES 42503 and CSES 52503. Corequisite: Lab component. Prerequisite: CSES 22003 and CSES 22001. (Typically offered: Fall Odd Years)

### **CSES 52604. Microbial Ecology. 4 Hours.**

A study of the microorganisms in soil and the biochemical processes for which they are responsible. Lecture 3 hours, laboratory 3 hours per week. Additional suggested prerequisites are BIOL 20003, CSES 22003, and ENSC 30003. Corequisite: Lab component. Prerequisite: BIOL 10103 and BIOL 38773 or ENSC 32203. (Typically offered: Fall Odd Years)

### **CSES 54503. Soil Chemistry. 3 Hours.**

Application of the principles of chemistry to processes of agronomic and environmental importance in soils. Soil clay mineralogy, soil solution thermodynamics, structure and reactivity of humus, surface complexation and ion exchange, electro-chemical phenomena, and colloidal stability. Prerequisite: CSES 22003 and CHEM 14203 and CHEM 14201. (Typically offered: Fall Even Years)

### **CSES 55303. 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. Graduate degree credit will not be given for both CSES 45503 and CSES 55303. Prerequisite: (CSES 22003 and CSES 22001) or CSES 35501. (Typically offered: Spring Odd Years)

**CSES 55403. Plant Genomics. 3 Hours.**

Plant genetics based on the study of whole genome sequence, transcriptome and proteome. Provides an overview of the principles and techniques of experimental and in silico genomics. Covers all areas of genome research including structural, comparative and functional genomics as well as proteomics. Prerequisite: CHEM 58403 or any graduate level genetics course. (Typically offered: Spring Even Years)

**CSES 56503. Fate and Transport of Organic Contaminants. 3 Hours.**

Fate and Transport of Organic Contaminants will present an overview of the transformation and transport processes that influence the environmental fate of organic contaminants, with an emphasis on agricultural pesticides. Biotic and abiotic factors influencing the movement and behavior of organic contaminants in soil and water will be covered extensively, with an emphasis on chemical mechanisms. Prerequisite: CHEM 14203 and CHEM 14201 and CSES 22003, or instructor consent. (Typically offered: Spring Odd Years)

**CSES 57003. Precision Agriculture Data. 3 Hours.**

This course will provide students with a holistic understanding of precision agriculture and crop/ecosystem monitoring with remote and proximal sensing technology. The course will also provide students with practical experience working with spatial data using GIS software in the context of precision agriculture. (Typically offered: Spring)

**CSES 6000V. Master's Thesis. 1-6 Hour.**

Master's Thesis. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

**CSES 7000V. Doctoral Dissertation. 1-18 Hour.**

Doctoral Dissertation. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.