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### **Crop, Soil and Environmental Management**

The Crop, Soil and Environmental Management major is administered through the School of Agricultural Sciences. The major has two specialized areas of study, with both specializations offering a general and science option. Students choosing the general option may select their upper division and elective credits from a wide choice of courses throughout the School of Agricultural Sciences and the University. If interests are more specialized, students may elect the science option and specialize in a specific discipline.

#### **Crop Production and Management Specialization**

This specialization provides the student with the background and preparation for careers in the biotechnology, seed, or plant industries incorporating both the traditional and molecular approaches to germplasm development, the agrichemical industry with expertise in crop management and protection employing a holistic approach to crop production by integrating the disciplines of plant pathology, entomology and weed science. This specialization will prepare students with careers with the Illinois/US EPA, US Forest Service, or the USDA (Agricultural Research, Forest, Animal and Plant Health Inspection Services).

#### **Soil Science Specialization**

Students selecting this specialization will receive training in soil quality management applying the principles of soil-water behavior, fertilizer use efficiency and soil ecology that influence the sustainability and quality of our soil and water resources. This specialization will prepare students with careers with the Illinois/US EPA and the USDA (National Resources Conservation Service) and the state Soil Water Conservation Service.

Opportunities for individual program development within the various specializations/options may be realized through work experience, internships, special studies, and seminars; however, no more than 30 hours of such unstructured coursework may be counted toward the degree. Students in all specializations/options are urged to make use of them to meet the goals and needs of their respective programs.

Students in all specializations must complete the crop, soil and environmental management core. These courses are CSEM 200, CSEM 240, one hour of CSEM 381, and CSEM 409.

*There may be extra expenses for field trips, manuals, or supplies in some courses.*

### **Bachelor of Science (B.S.) in Crop, Soil, and Environmental Management**

## B.S. Crop, Soil, and Environmental Management - General Specialization Degree Requirements

Degree Requirements	Credit Hours
University Core Curriculum Requirements	39
Foundation Skills: CMST 101, ENGL 101, ENGL 102, MATH 108, UNIV 101	13
Disciplinary Studies: Fine Arts, Human Health, Humanities, CHEM 140A, PLB 200, ABE 204, Social Science	23
Integrative Studies (Multicultural/Diversity)	3
Requirements for Major in Crop, Soil and Environmental Management Core Requirements	41
CSEM 200, CSEM 240, CSEM 300, CSEM 305, CSEM 381, CSEM 401, CSEM 403A, CSEM 409, CSEM 420, CSEM 447, CSEM 448, CSEM 468	35
CSEM 300- or 400-level	6
Other required courses	8
CHEM 140A, CHEM 140B	5
PLB 200	1
ABE 333, ABE 360, AGRI 323 or AGSE 318	2
Electives	32
Agricultural Sciences Electives 300- or 400- level	6
Agricultural Sciences Electives	9
Electives	17
Total	120

## B.S. Crop, Soil, and Environmental Management - Science Specialization Degree Requirements

Degree Requirements	Credit Hours
University Core Curriculum Requirements	39
Foundation Skills: CMST 101, ENGL 101, ENGL 102, MATH 108, UNIV 101	13

Degree Requirements	Credit Hours
Disciplinary Studies: Fine Arts, Human Health, Humanities, CHEM 200, CHEM 201, PLB 200, ABE 204, Social Science	23
Integrative Studies (Multicultural/Diversity)	3
Requirements for Major in Crop, Soil and Environmental Management Core Requirements:	41
CSEM 200, CSEM 240, CSEM 300, CSEM 305, CSEM 381, CSEM 401, CSEM 403A, CSEM 409, CSEM 420, CSEM 447, CSEM 448, CSEM 468	35
CSEM 300- or CSEM 400-level	6
Other required courses:	37
CHEM 200, CHEM 201, CHEM 210, CHEM 211, CHEM 340, CHEM 341, CHEM 350	13
PLB 200, PLB 320	5
GEOG 434	3
MATH 109, MATH 140	7
PHYS 203A, PHYS 203B	6
AGSE 472	3
Electives	3
Agricultural Sciences Electives 300- or 400- level	3
<b>Total</b>	<b>120</b>

**B.S. Crop, Soil, and Environmental Management - Soil Science (General) Specialization Degree Requirements**

Degree Requirements	Credit Hours
University Core Curriculum Requirements	39
Foundation Skills: CMST 101, ENGL 101, ENGL 102, MATH 108, UNIV 101	13
Disciplinary Studies: Fine Arts, Human Health, Humanities, CHEM 140A, PLB 200, ABE 204, Social Science	23

Degree Requirements	Credit Hours
Integrative Studies (Multicultural/Diversity)	3
Requirements for Major in Crop, Soil and Environmental Management Core Requirements:	40
CSEM 200, CSEM 240, CSEM 381, CSEM 409, CSEM 441, CSEM 442, CSEM 443, CSEM 446, CSEM 447, CSEM 448, CSEM 454	32
CSEM 300- or 400-level	8
Other required courses:	6
CHEM 140A, CHEM 140B	5
PLB 200	1
Electives	35
Agricultural Sciences Electives at 300- or 400-level	9
Agricultural Sciences Electives	9
Electives	17
Total	120

**B.S. Crop, Soil, and Environmental Management - Soil Science (Science)  
Specialization Degree Requirements**

Degree Requirements	Credit Hours
University Core Curriculum Requirements	39
Foundation Skills: CMST 101, ENGL 101, ENGL 102, MATH 108, UNIV 101	13
Disciplinary Studies: Fine Arts, Human Health, Humanities, CHEM 200, CHEM 201, PLB 200, ABE 204, Social Science	23
Integrative Studies (Multicultural/Diversity)	3
Requirements for Major in Crop, Soil and Environmental Management Core Requirements:	38
CSEM 200, CSEM 240, CSEM 381, CSEM 409, CSEM 441, CSEM 442, CSEM 443, CSEM 446, CSEM 447, CSEM 448, CSEM 454	32

Degree Requirements	Credit Hours
CSEM 300- or 400-level	6
Other required courses:	37
CHEM 200, CHEM 201, CHEM 210, CHEM 211, CHEM 340, CHEM 341, CHEM 350	13
PLB 200, PLB 320	5
GEOG 434	3
MATH 109, MATH 140	7
PHYS 203A, PHYS 203B	6
AGSE 472	3
Electives	6
Total	120

## Crop Breeding, Genetics and Biotechnology Minor

A minor in Crop Breeding, Genetics and Biotechnology is offered. A total of 15 hours is required with at least 12 hours taken at the University. One course must be either CSEM 200 or HORT 220 and a second course must be CSEM 305. Additional credit hours may be selected from CSEM 401, CSEM 403A, CSEM 405, CSEM 419, CSEM 426, CSEM 433, CSEM 435, CSEM 438, and HORT 430. An advisor must be consulted before selecting this minor.

## Crop, Soil, and Environmental Management Minor

A minor in Crop, Soil and Environmental Management is offered. A total of 15 hours is required and at least 12 hours taken at the university. One course may be selected from CSEM 200, or CSEM 240 and at least eight hours from 300- or 400-level structured courses. An advisor must be consulted before selecting this minor.

## Capstone Option for Transfer Students

The SIU Capstone Option may be available to eligible students who have earned an associates degree or the equivalent. The Capstone Option reduces the University Core Curriculum requirements from 39 to 30 hours, therefore reducing the time to degree completion. See the Capstone Option section for more information on this option.

## Technology Fee

The College of Agricultural, Life, and Physical Sciences assesses undergraduate majors a technology fee of \$4.58 per credit hour up to 12 credit hours. The fee is charged Fall and Spring semester.

## Crop, Soil and Environmental Management Courses

**CSEM200 - Introduction to Crop Science** [IAI Course: AG 903] Production of important field crops of the world with greatest emphasis on U.S. and Midwestern field crops; crop production changes and adjustments, crop distribution over U.S., and crop groups and classifications, special agronomic problems, crop enemies, crop ecology, fertilizer and liming practices, tillage, crop improvement through breeding. Field trip (no cost). Credit Hours: 3

**CSEM240 - Soil Science** [IAI Course: AG 904] Basic and applied chemical, physical, and biological concepts in soils. The origin, classification and distribution of soils and their relationship to humans and plant growth. Prerequisite: CHEM 140A or higher. Lab fee: \$15. Credit Hours: 4

**CSEM250 - Pesticide Application** The student will learn the basic principles needed to successfully use pesticides in agricultural production systems. The use and function of application equipment to deliver pesticides in a safe and effective manner will be taught. Basic understanding of scouting, action threshold and decision making, active ingredient rotation, product formulation, and the generation, delivery and function of droplets will be covered. Course fee of \$178 is required. Students will be required to pass Illinois pesticide application basic standards exam and at least two other specialty certifications for successful completion of the class. Credit Hours: 1

**CSEM257 - Work Experience** Credit for on-campus work experience in the areas of plant and soil science, or credit through a cooperative program developed between the program and the Office of Student Work and Financial Assistance. Credit awarded based on 4 hours of work per week during the semester for each hour of credit. Special approval needed from the program. Mandatory Pass/Fail. Credit Hours: 1-10

**CSEM300 - Field Crop Production** Principles of growth and production of field crops and their utilization. Laboratory demonstrating principles including research projects and modern production techniques. Prerequisite: CSEM 200. Credit Hours: 4

**CSEM305 - Plant Genetics** Principles of genetics and evolution of plants, elementary plant breeding, and the interaction between plant breeding and industry. Prerequisite: CSEM 200. Credit Hours: 4

**CSEM347 - Urban Soils** A study of the function, structure, and management of soils in urban environments. The emphasis of this class is on urban horticulture: turf, urban forests, and landscape plants in urban settings. The course will focus on the understanding and implementation of basic soil concepts, with an emphasis on sustainability and management of urban soils to minimize maintenance and maximize its utility. Prerequisite: CSEM 240. Lab fee: \$80. Credit Hours: 3

**CSEM359 - Intern Program** Supervised work experience program in either an agricultural agency of the government or agribusiness. Restricted to junior standing. Special approval needed from the program. Mandatory Pass/Fail. Credit Hours: 1-6

**CSEM370 - Agroecology-Sustainable Agricultural Systems** An introduction to the biotic, natural resource, environmental, social and economic implications and requirements of sustainable agriculture. Prerequisite: CSEM 200. Credit Hours: 3

**CSEM381 - Plant and Soil Science Seminar** Discussion of special topics and/or problems in the various areas of plant and soil science. Prerequisite: CMST 101. Restricted to junior standing. Credit Hours: 1

**CSEM390 - Special Studies in Plant and Soil Science** Assignments involving research and individual problems. Special approval needed from the program. Credit Hours: 1-8

**CSEM391 - Honors in Plant and Soil Science** Independent undergraduate research sufficiently important to three hours per week of productive effort for each credit hour. Special approval needed from the program. Credit Hours: 1-4

**CSEM400 - Trends in Soil Science and Agronomy** A discussion session format will be employed as a means of acquainting students with recent literature and allowing them to remain current with latest developments in their area of specialty. Special approval needed from the program. Credit Hours: 3

**CSEM401 - Agricultural Plant Pathology** A study of micro- and macro organisms and environmental factors that cause disease in plants of agricultural importance; of the mechanisms by which these factors induce disease in plants; and of the methods for managing diseases and reducing the damage they cause. Prerequisite: CSEM 200. Credit Hours: 2

**CSEM403A - Field Crops Diseases** A survey of major diseases of important field crops in the United States. Disease identification, cycles, and management strategies will be addressed. Not for graduate credit. Prerequisite: CSEM 200. Credit Hours: 2

**CSEM404 - Writing Fact Sheets in Agronomy and Soil Science** A thorough literature review, effective reading, evaluating facts, structuring a fact sheet, effective writing for layman audience, learning about writing a journal article, learning how to translate a journal article into an extension shorter version, and principles of PowerPoint presentation and teaching. Credit Hours: 2

**CSEM405 - Plant Genetic Improvement** The course focuses on the partitioning and manipulation of variation; different conventional and molecular selection methods; and the impact of plant improvement on agriculture, society, and environment. Prerequisite: CSEM 305 with a grade of C or better. Credit Hours: 3

**CSEM408 - World Crop Production** (Same as HORT 408) Climatological, ecological, physiological, sociological, and economical factors influencing world crop production practices. This course intends to provide students the opportunity to observe world crop production systems on a firsthand basis. Crop specific production, harvesting, processing, and marketing methods will be discussed. Special approval needed from the program. Credit Hours: 3

**CSEM409 - Crop Physiology** (Same as HORT 409) Principles of basic plant physiology. Topics include cell structure, photosynthesis, respiration, water and mineral relations, vascular transport and plant growth regulators. Prerequisites: PLB 200, CHEM 140B. Fee: \$50. Credit Hours: 3

**CSEM419 - Plant Molecular Biology** (Same as PLB 419) A survey of molecular phenomena unique to plant systems. Topics will include: genome organization and synteny between plant genomes, transcriptional and post-transcriptional control of gene expression, signal transduction, epigenetics, plant-pathogen interactions and responses to biotic- and abiotic-stresses. Prerequisite: CSEM 305. Credit Hours: 3

**CSEM420 - Crop Pest Control** Study of field pests of forest, orchard, field, and garden crops; pest control principles and methods; control strategy; and consequences of pest control operations. Prerequisite: CSEM 200. Lab fee: \$35. Credit Hours: 4

**CSEM425 - Advanced Plant Physiology and Ecophysiology** Advanced topics in plant physiology. Abiotic factors such as light, water, temperature, and nutrients, as well as emerging man-made pollutants such as nanoparticle contamination. Biotic factors such as plant-microbe signaling and the rhizosphere microbiome, plant-plant signaling, and competition for resources. These topics are covered at molecular and organismal levels, as well as the physiological ecology of these processes on a larger scale. This course offers a perspective of how these processes work in nature, as well as how they are or might be manipulated for crop or agriculture practice improvement. Undergraduate Prerequisite: PLB 320 or PSAS 409. Lab fee: \$35. Credit Hours: 5

**CSEM426 - Genomics and Bioinformatics** This course is designed to introduce students from a variety of backgrounds and programs to the scope and methodology of genomic and bioinformatic sciences. Real problems and solutions from genome data analysis are studied in this course to see how high throughput genomics is driving bioinformatics, and changing the biological sciences in revolutionary way. Prerequisite: CSEM 305. Credit Hours: 4

**CSEM427 - Plant Biochemistry** (Same as PLB 427) Exploration of fundamental biochemical pathways in plants with an emphasis upon carbon and nitrogen metabolism. Not for graduate credit. Special approval needed from the program. Lab fee: \$35. Credit Hours: 5

**CSEM433 - Introduction to Agricultural Biotechnology** (Same as AGSE 433, ANS 433, HORT 433, PLB 433) This course will cover the basic principles of plant and animal biotechnology using current examples; gene mapping in breeding, transgenic approaches to improve crop plants and transgenic

approaches to improve animals will be considered. Technology transfer from laboratory to marketplace will be considered. An understanding of gene mapping, cloning, transfer, and expression will be derived. Not for graduate credit. Special approval needed from the program. Credit Hours: 3-7

**CSEM435 - Agricultural Molecular Biotechnology Seminar** (Same as ANS 435) Molecular biology is rapidly making important contributions to agricultural science through biotechnology. An appreciation of the techniques of molecular biology and their application to plant improvement is important to all in agriculture and biology. The relationships between plant molecular biology and the biotechnology industry will be discussed. Presentations on particular research problems will be made. Graded P/F. Not for graduate credit. Credit Hours: 1-4

**CSEM438 - Plant and Animal Molecular Genetics Laboratory** (Same as AGSE 438, PLB 438, ZOOL 438) Arabidopsis and Drosophila model organisms, lab-based training in laboratory safety, reagent preparation, phenotype analysis, genetics, DNA and RNA analysis, PCR, cDNA construction, cloning and sequencing of genes. Includes plant and bacterial transformation, and a population level analysis of genetic variation using RAPD markers in grasses and Alu insertion in humans. Two 2-hr labs and one 1-hr lecture per week. Not for graduate credit. Prerequisite: BIOL 305 or equivalent or consent of instructor. Lab fee: \$30. Credit Hours: 3

**CSEM441 - Soil Morphology and Classification** Development, characteristics, and identification of soils, study of profiles; and interpretation and utilization of soil survey information in land use planning. Not for graduate credit. Prerequisite: CSEM 240. Field trip costing approximately \$5. Credit Hours: 3

**CSEM442 - Soil Physics** A study of the physical properties of soils with special emphasis on soil and water relationships, soil productivity, and methods of physical analysis. Not for graduate credit. Prerequisite: CSEM 240. Credit Hours: 3

**CSEM443 - Soil Management** The soil as a substrate for plant growth. Properties of the soil important in supplying the necessary mineral nutrients, water and oxygen and for providing an environment conducive to plant root system elaboration. Soil management techniques important in optimizing plant growth. Not for graduate credit. Prerequisite: CSEM 240. Credit Hours: 3

**CSEM445 - Irrigation Principles and Practices** This course will cover basic principles of irrigation sciences; water requirements of crops; soil water relationship; water application methods including flooding, sprinkler, and drip (or trickle) systems; water conveyance, distribution and measurement; evaluation of irrigation efficiency; and irrigation scheduling. Considerations will also include crop production effects and economic aspects of irrigation. Not for graduate credit. Prerequisite: CSEM 240. Credit Hours: 3

**CSEM446 - Soil and Water Conservation** Covers the principles of hydrologic processes and soil erosion. Consideration will be given to the occurrence of soil erosion as it affects humans, food production, and the environment. The methods and technologies for protecting against and controlling of erosion will also be discussed. Not for graduate credit. Special approval needed from the program. Credit Hours: 3

**CSEM447 - Fertilizers and Soil Fertility** Recent trends in fertilizer use and the implications of soil fertility build up to sufficiency and/or toxicity levels; the behavior of fertilizer material in soils and factors important in ultimate plant uptake of the nutrients; the plant-essential elements in soils and ways of assessing their needs and additions; tailoring fertilizer for different uses and management systems; implication of excessive fertilization in our environment. Not for graduate credit. Concurrent enrollment in CSEM 448 required. Prerequisite: CSEM 240. Credit Hours: 3

**CSEM448 - Soil Fertility Evaluation** A laboratory course designed to acquaint one with practical soil testing and plant analysis methods useful in evaluating soil fertility and plant needs. One hour lecture, two hours laboratory. Not for graduate credit. Concurrent enrollment in CSEM 447 required. Prerequisite: CSEM 240. Lab fee: \$15. Credit Hours: 2

**CSEM454 - Soil Microbiology** (Same as MICR 454) A study of microbial numbers, characteristics and biochemical activities of soil microorganisms with emphasis on transformations of organic compounds,

nitrogen phosphorus, sulfur, iron, and plant essential nutrients. Not for graduate credit. Prerequisite: CSEM 240 or MICR 301. Lab fee: \$15. Credit Hours: 4

**CSEM455 - Biology of Plant-Microbe Interactions** The molecular basis of host-pathogen interactions and disease development in plants is examined with a critical review of original and current literature focusing on the mechanisms of pathogenesis, virulence, disease development and resistance, and response mechanisms in plants. Prerequisite: CSEM 200. Credit Hours: 3

**CSEM468 - Weeds - Their Control** Losses due to weeds, weed identification and distribution, methods of weed dissemination and reproduction, mechanical, biological, and chemical control of weeds. State and Federal legislation pertaining to weed control herbicides. Herbicide commercialization. Not for graduate credit. Prerequisite: CSEM 200. Field trips costing approximately \$5. Credit Hours: 3

**CSEM486 - Invasive Plant Ecology and Management** (Same as FOR 486) Ecology and evolution of invasive plant species, with a focus on land management, including characteristics and biology, introduction and spread, population dynamics, community impacts and ecological interactions, and invasive plant evolution and adaptation, as well as management techniques and considerations, including biological, chemical, and mechanical control. Prerequisite: BIOL 307 or consent of instructor. Restricted to junior standing. Credit Hours: 3

**CSEM487 - Soil Health** Soil Health is a hands-on training course which provides an understanding of soil physical, chemical, and biological properties of soil health and interpret the results. This course also discusses role of healthy soils in crop production, environment and farm economics and their trade-offs. Prerequisite: Students must pass CSEM 240 prior to taking this course. Credit Hours: 3

## Crop, Soil and Environmental Management Faculty

**Bond, Jason**, Professor, Ph.D., Louisiana State University, 1999.

**Fakhoury, Ahmad**, Associate Professor, Ph.D., Purdue University, 2001.

**Gage, Karla**, Associate Professor, Ph.D., Southern Illinois University, 2013.

**Jones, K. L.**, Professor and Chair, Ph.D., Texas A&M University, 1999.

**Kantartzi, Stella**, Associate Professor, Ph.D., Aristotle University of Thessaloniki, 2006.

**Lightfoot, David A.**, Professor, Ph.D., University of Leeds, 1984.

**Meksem, Khalid**, Professor, Ph.D., University of Cologne, 1995.

### Emeriti Faculty

**Chong, She Kong**, Professor, Emeritus, Ph.D. University of Hawaii, 1979.

**Klubek, Brian P.**, Professor, Emeritus, Ph.D., Utah State University, 1977.

**McGuire, James M.**, Professor, Emeritus, Ph.D., North Carolina State University, 1961.

**Olsen, Farrel J.**, Professor, Emeritus, Ph.D., Rutgers University, 1961.

**Russin, John S.**, Professor, Emeritus, Ph.D., University of Kentucky, 1983.

**Schmidt, Michael E.**, Associate Professor, Emeritus, Ph.D., Southern Illinois University, 1994.

**Stucky, Donald J.**, Professor, Emeritus, Ph.D., Purdue University, 1963.

**Tweedy, James A.**, Professor, Emeritus, Ph.D., Michigan State University, 1966.

**Varsa, Edward C.**, Professor, Emeritus, Ph.D., Michigan State University, 1970.

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