Crop Science (CPSC)

Robert Bacon
Professor and Head
115 Plant Science Building
479-575-2347

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

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

Requirements for a Major in Crop Science (CPSC)

State minimum core and discipline specific general education requirements.

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

English/Communications 15
- ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013)
- ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023)
- ENGL 2003 Advanced Composition
  or ENGL 303 Technical and Report Writing (ACTS Equivalency = ENGL 2023)
- COMM 1313 Public Speaking (ACTS Equivalency = SPCH 1003)
- CSES 3023 Crop, Soil, and Environmental Sciences Colloquium

US History or Government 3
- Select 3 hours U.S. History course from University Core.

Mathematics and Computer Science 6
- MATH 1203 College Algebra (ACTS Equivalency = MATH 1103) (or higher level MATH)

Select one of the following:
- AGME 2903 Agricultural and Human Environmental Sciences Applications of Microcomputers (Students minoring in Agricultural Business should choose AGME 2903.)
- AGST 4023 Principles of Experimentation
- STAT 2303 Principles of Statistics (ACTS Equivalency = MATH 2103)

Physical and Biological Sciences 18-23
- BIOL 1543 Principles of Biology (ACTS Equivalency = BIOL 1014)
- & BIOL 1541L Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)
- BIOL 1613 Plant Biology (ACTS Equivalency = BIOL 1034 & BIOL 1611L Lecture)
  and Plant Biology Laboratory (ACTS Equivalency = BIOL 1034 Lab)
  or CSES 120 Introduction to Plant Sciences
- CHEM 2613 Organic Physiological Chemistry (ACTS & CHEM 2611L Equivalency = CHEM 1224 Lecture)
  and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)

Select one of the following:
- CHEM 1073 Fundamentals of Chemistry (ACTS Equivalency = CHEM 1214 Lecture)
  and Fundamentals of Chemistry Laboratory (ACTS Equivalency = CHEM 1214 Lab)
- CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture)
  and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)

AND
- CHEM 1123 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture)
  and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)

Select one of the following:
- BIOL 4303 Plant Physiology
- ANSC 3123 Principles of Genetics
- POSC 3123 Principles of Genetics
- BIOL 2323 General Genetics

Fine Arts and Humanities 6
- Select one Fine Arts course and one Humanities course from University Core.

Social Sciences 9
- AGEC 1103 Principles of Agricultural Microeconomics
- Select 6 hours from Social Sciences from University Core (3 hours must be outside AGEC/ECON discipline) Students minoring in Agricultural Business should choose AGEC 2103*.

CPSC Requirements 26

General Agronomy
- CSES 2103 Crop Science
  & CSES 2101L and Crop Science Laboratory
- CSES 2203 Soil Science
  & CSES 2201L and Soil Science Laboratory
- CSES 4013 Advanced Crop Science
- CSES 4224 Soil Fertility

Select one from the following (3 hours)**:
- CSES 462V Internship
- CSES 400V Special Problems
- Select at least 8 hours from the following two groups. At least 6 hours must be from Group A.

Group A
- CSES 3112 Forage Management
- CSES 3312 Cotton Production
- CSES 3322 Soybean Production
- CSES 3332 Rice Production
- CSES 3342 Cereal Grain Production
Crop Science (CPSC)

**Special Problems**
Bumpers College Dean's Office. Credit. Students who wish to declare a minor must contact the Courses selected within major cannot be taken for duplicate credit. Students applying toward a minor associated with CPSC Requirements Groups C-G) can be taken for duplicate credit in fulfilling the General Agronomy requirement.

**Select one group (C-G) for CPSC Requirements (9-12 hours).**

**GROUP C - Pest Management (9 hours)**
CSES 4113 Ecology and Morphology of Weedy and Invasive Plants

**GROUP D - Agricultural Business (12 hours)**
AGEC 3403 Farm Business Management

**GROUP E - Crop Biotechnology (10 hours)**
PLPA 4333 Biotechnology in Agriculture

**GROUP F - Soil Science (9-10 hours)**
CSES 3214 Soil Resources and Nutrient Cycles

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

**Crop Science B.S.A. Nine-Semester Degree Program**
Because the Crop Science program requires an internship, it doesn’t qualify for the Eight-Semester Program. See more about the Eight-Semester Degree Policy (http://catalog.uark.edu/undergraduateguides/academicregulations/eightsemesterdegreecompletionpolicy/) for university requirements of the program.
### First Year

<table>
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<th>Course</th>
<th>Fall</th>
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<td>History University Core Elective</td>
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<td>UNIV 1001 University Perspectives</td>
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<td>CSES 1203 Introduction to Plant Sciences or BIOL 1613 and BIOL 1611L</td>
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<td>ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023) (If exempt, see adviser for communication courses.)</td>
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<td>COMM 1313 Public Speaking (ACTS Equivalency = SPCH 1003)</td>
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### Second Year

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<td>ENGL 2003 Advanced Composition or ENGL 3053 Technical and Report Writing (ACTS Equivalency = ENGL 2023)</td>
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<td>Social Science University Core Elective</td>
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<td>Fine Arts/Humanities University Core Elective</td>
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<td>CHEM 2613 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) &amp; CHEM 2611L Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab) or CHEM 1123 and CHEM 1121L</td>
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<td>PLPA 3004 Principles of Plant Pathology</td>
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<td>ENTO 3013 Introduction to Entomology</td>
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<tr>
<td>BIOL 2323 General Genetics</td>
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<td>ANSC/POSC 3123 Principles of Genetics</td>
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<td>AFLS 401V Special Topics in AFLS</td>
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<td>CSES 4133 Ecology and Morphology of Weedy and Invasive Plants</td>
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<td>CSES 4224 Soil Fertility</td>
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<td>CPSC Requirement Elective</td>
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<td>CSES 4013 Advanced Crop Science</td>
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<td>CPSC Requirement Elective</td>
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<td>General Electives</td>
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**Total Units in Sequence:** 120
**Minor in Crop Science (CPSC-M)**

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

<table>
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<tr>
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<tr>
<td>CSES 2103</td>
<td>Crop Science</td>
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<tr>
<td>CSES 2203</td>
<td>Soil Science</td>
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Select 12 hours with at least 4 hours coming from Group A: 12

**Group A**

- CSES 3112  Forage Management
- CSES 3312  Cotton Production
- CSES 3322  Soybean Production
- CSES 3332  Rice Production
- CSES 3342  Cereal Grain Production

**Group B**

- CSES 3214  Soil Resources and Nutrient Cycles
- CSES 4013  Advanced Crop Science
- CSES 4103  Plant Breeding
- CSES 4133  Ecology and Morphology of Weedy and Invasive Plants
- CSES 4143  Principles of Weed Control
- CSES 4224  Soil Fertility

Total Hours 18

**Minor in Crop Biotechnology (CPBT-M)**

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

<table>
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<th>Course Code</th>
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<tr>
<td>PLPA 4333</td>
<td>Biotechnology in Agriculture</td>
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**Genetics**

- CSES 400V  Special Problems (two 2-hour courses taken in two different semesters)

Select one of the following: 3

- BIOL 2323  General Genetics
- ANSC/POSC 3123  Principles of Genetics

**Controlled Electives**

Select two of the following: 6

- BIOL 4303  Plant Physiology
- CHEM 3813  Elements of Biochemistry
- CSES 4103  Plant Breeding

Total Hours 16

**Faculty**

- **Bacon, Robert Keith**, Ph.D. (Purdue University), M.S., B.S.A., (University of Arkansas), Professor, 1984.
- **Barber, Thomas**, Ph.D., M.S., B.S. (University of Arkansas), Professor, 2007.
- **Bartlett, Andrew**, Ph.D., M.S. (University of Georgia), M.S. (College of Charleston), B.S. (Coastal Carolina University), Clinical Assistant Professor, 2016.

- **Bourland, Fred**, Ph.D. (Texas A&M University), M.S., B.S.A. (University of Arkansas), Professor, 1988.
- **Burgos, Nilda Roma**, Ph.D., M.S. (University of Arkansas), B.S. (Visayas State College of Agriculture-Philippines), Professor, 1998.
- **Counce, Paul Allen**, Ph.D. (University of Georgia), M.S. (Purdue University), B.S. (University of Tennessee-Martin), Professor, 1983.
- **Daniels, Michael B.**, Ph.D., M.S. (University of Arkansas), B.S. (Pennsylvania State University), Professor, 1996.
- **Espinoza, Leonel A.**, Ph.D., M.S. (University of Florida), B.S. (Iowa State University), Associate Professor, 2003.
- **Gburi, Edward E.**, Ph.D., M.S. (The Ohio State University), B.S. (Saint Francis University), Professor, 1987.
- **Hardke, Jarrod T.**, Ph.D. (Louisiana State University), B.S.A. (University of Arkansas), Associate Professor, 2013.
- **Kelley, Jason**, Ph.D., M.S. (Oklahoma State University), B.S. (Kansas State University), Associate Professor, 2003.
- **Lee, Jung Ae**, Ph.D., M.S. (University of Georgia), M.A., B.A., (Ewha Womans University), Assistant Professor, 2016.
- **Mason, Richard Esten**, Ph.D., B.A. (Texas A&M University), Associate Professor, 2010.
- **Mauroumoustakos, Andy**, Ph.D., M.S. (Oklahoma State University), B.S. (Oral Roberts University), Professor, 1989.
- **Miller, David M.**, Ph.D. (University of Georgia), M.S. B.S. (Purdue University), Professor, 1982.
- **Mozaffari, Morteza**, Ph.D. (University of Delaware), M.S., B.S. (University of Massachusetts), Assistant Professor, 2002.
- **Mozzoni, Leandro**, Ph.D. (University of Arkansas), M.S. (Rosario National University), Associate Professor, 2017.
- **Norman, Richard J.**, Ph.D. (University of Illinois-Urbana-Champaign), M.S., B.S. (University of Missouri), Professor, 1983.
- **Norsworthy, Jason Keith**, Ph.D., M.S. (University of Arkansas), B.S. (Louisiana Tech University), Professor, 2006.
- **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, 2011.
- **Purcell, Larry C.**, Ph.D. (University of Florida), M.S., B.S. (University of Georgia), Distinguished Professor, 1993.
- **Roberts, Trenton L.**, Ph.D. (University of Arkansas), M.S. (University of Arizona), B.S. (Oklahoma State University), Associate Professor, 2010.
- **Robertson, Bill**, Ph.D., M.S. (Texas A&M University), B.S. (West Texas State University), Professor, 2014.
- **Ross, Jeremy**, Ph.D., M.S., B.S. (University of Arkansas), Professor, 1996.
- **Savin, Mary Cathleen**, Ph.D., M.S. (University of Rhode Island), B.S. (University of Notre Dame), Professor, 2002.
- **Scott, Robert C.**, Ph.D. (Mississippi State University), M.S., B.S. (Mississippi State University), Professor, 1998.
- **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.
- **Sharpley, Andrew N.**, Ph.D. (Massey University, New Zealand), B.S. (University College of North Wales), Distinguished Professor, 2006.
- **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.
Courses

CSES 1011. Introduction to Crop, Soil, and Environmental Science. 1 Hour.
An introduction to the CSES department and majors in Environmental Soil and Water Sciences and Crop Management. Emphasis will be placed on issues and opportunities within these disciplines and orienting students to the department and University of Arkansas. Required of all department majors with less than 24 semester credit hours. Recitation 1 hour 20 minutes per week for the first eight weeks of the semester. Prerequisite: Freshman and sophomore standing only. (Typically offered: Irregular)

CSES 1203. Introduction to Plant Sciences. 3 Hours.
An introduction to basics of agricultural crop plant structure, growth, and production. (Typically offered: Fall and Spring)

CSES 2003. Introduction to Weed Science. 3 Hours.
Fundamental, practical concepts of weed control and weed biology; equipment and techniques used in modern weed control practices; and basic recommendations and systems for specific agronomic and horticultural crops. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CSES 1203 or CSES 2103 or HORT 2003. (Typically offered: Irregular)

CSES 2012. Introduction to Organic Crop Production. 2 Hours.
An introduction to the principles of organic agriculture and ecology and the regulations defining organic production and certification. Additional topics include crop rotations for pest management and for increasing soil organic matter, feeding the soil and plant nutrition, soil health, and green manuring, corporate agriculture and genetically modified organisms. (Typically offered: Irregular)

CSES 2013. Pest Management. 3 Hours.
Introduction to basic principles of pest management as they relate to vertebrate animals, insects, plant disease and weeds. Selected pests are studied with emphasis on current management approaches and alternative pest control. (Typically offered: Spring)

CSES 2101L. Crop Science Laboratory. 1 Hour.
A series of laboratory experiments designed to reinforce principles of plant growth and development, reproduction, classification, and the utilization of plant products. Emphasis is placed on major crop plant species. Experiments are conducted by individuals or by teams. Laboratory consists of a single, 2-hour period each week. Required for Crop Management majors. Corequisite: CSES 2103. (Typically offered: Spring)

CSES 2103. Crop Science. 3 Hours.
Principles of crop growth, development, and utilization and how these principles relate to production. Emphasis on major agronomic crop species. Lecture 3 hours per week. (Typically offered: Spring)

CSES 2201L. Soil Science Laboratory. 1 Hour.
Field and laboratory exercises related to the study of the physical, chemical, and biological properties of soils. Laboratory mandatory for all crop management and environmental, soil, and water science majors and optional for others. Laboratory 2 hours per week. Pre- or Corequisite: CSES 2203. (Typically offered: Fall and Spring)

CSES 2203. Soil Science. 3 Hours.
Origin, classification, and physical, chemical, and biological properties of soils. Lecture 3 hours, discussion 1 hour per week. Corequisite: Drill component. Prerequisite: MATH 1203 and CHEM 1103 or CHEM 1073. (Typically offered: Fall and Spring)

CSES 3023. Crop, Soil, and Environmental Sciences Colloquium. 3 Hours.
A communication-intensive course covering topics in agronomy and environmental, soil, and water science with particular emphasis on spoken communication but also including written communication, group activities, professionalism, ethics, problem solving, and information retrieval. A student-oriented class with collaborative participation. Colloquium workshop: 3 hours per week. Prerequisite: COMM 1313 and Junior or Senior standing only. (Typically offered: Fall)

CSES 3112. Forage Management. 2 Hours.
Forage crops for pasture, hay, and silage with reference to growth and development, production, nutritional quality, and grazing systems. Lecture 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Irregular)

CSES 3214. Soil Resources and Nutrient Cycles. 4 Hours.
Integration of the fundamental concepts of the biological, chemical, and physical properties of soil systems and their roles in managing soil resources. Lecture 3 hours, laboratory 3 hours per week. Pre- or Corequisite: BIOL 2013 and BIOL 2011L. Corequisite: Lab component. Prerequisite: CSES 2203. (Typically offered: Spring Odd Years)

CSES 3312. Cotton Production. 2 Hours.
Principles and techniques associated with production of cotton. Recitation 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Fall Even Years)

CSES 3322. Soybean Production. 2 Hours.
An overview of the history and utilization of soybean as well as the physiological and environmental basis for the development of economical soybean production practices. Recitation 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Spring Odd Years)

CSES 3332. Rice Production. 2 Hours.
A study of the principles and practices involved in rice culture worldwide with major emphasis on the United States. Recitation 2 hours per week. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Fall Odd Years)

CSES 3342. Cereal Grain Production. 2 Hours.
An overview of the botany, production, cultural practices, soil & climatic adaptation and utilization of the major cereal grain crops. Prerequisite: CSES 1203 or CSES 2103. (Typically offered: Spring Even Years)

CSES 335V. Soil Profile Description. 1-2 Hour.
Training for soil profile description writing and membership of judging teams. (Typically offered: Fall) May be repeated for up to 8 hours of degree credit.

CSES 3603. Metrics for Sustainable Agricultural Systems. 3 Hours.
Analysis of productive agricultural systems necessary to meet expanding demand worldwide for food, feed, fiber and fuel while preserving critical ecosystem services to avoid future catastrophic failures of the biosphere. Characterization of sustainable systems using well-defined metrics, indicators and indices, including reference to sustainability certifications. Metrics for soil, water, atmosphere and biodiversity. Applications in crop and animal production with scales from field to watershed to eco-region. Examining the process and methodologies of integrating metrics into indices to support sustainable supply chain decisions. Discussion of life cycle analyses and current initiatives toward approaching agricultural systems sustainability. Technical course intended for students in agriculture, biology, business, engineering, and environmental sciences. (Typically offered: Fall) This course is cross-listed with BENG 3603.
CSES 400V. Special Problems. 1-6 Hour.
Work on special problems in crop, soil and environmental sciences or related field. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

CSES 4013. Advanced Crop Science. 3 Hours.
Fundamental concepts of crop physiology, crop improvement, seed science, and crop production systems. Recitation 3 hours per week. Prerequisite: CSES 2103 and CSES 2203. (Typically offered: Spring)

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

CSES 4103. Plant Breeding. 3 Hours.
Basic principles involved in plant breeding programs to improve crop plants and seed programs. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: ANSC 3123 or BIOl 2323. (Typically offered: Fall Even Years)

CSES 4133. Ecology and Morphology of Weedy and Invasive Plants. 3 Hours.
Study of weeds as economic pests occurring in both agricultural and nonagricultural situations and including poisonous plants and other specific weed problems. Gross morphological plant family characteristics which aid identification, habitat of growth and distribution, ecology, competition, and allelopathy are discussed. Lecture 2 hours, laboratory 2 hours a week. Corequisite: Lab component. Prerequisite: CSES 2103 or HORT 2003. (Typically offered: Fall)

CSES 4143. Principles of Weed Control. 3 Hours.
Advanced concepts and technology used in modern weed control practices and study of the chemistry and specific activity of herbicides in current usage. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CHEM 1073 and CHEM 1071L. (Typically offered: Spring)

CSES 4224. Soil Fertility. 4 Hours.
Study of the soil’s chemical, biological and physical properties, and human modification of these properties, as they influence the uptake and utilization of the essential nutrients by plants. Lecture 3 hours, laboratory 2 hours per week. Pre- or Corequisite: CHEM 1123 and CHEM 1121L or (CHEM 1073 and CHEM 1071L and CHEM 2613 and CHEM 2611L). Corequisite: Lab component. Prerequisite: CSES 2201L and CSES 2203. (Typically offered: Fall)

CSES 4253. Soil Classification and Genesis. 3 Hours.
Lecture and field evaluation of soil properties and their relation to soil genesis and soil classification with emphasis on soils of Arkansas. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CSES 2203 and CSES 2201L. (Typically offered: Fall Odd Years)

CSES 4303. Bioenergy Feedstock Production. 3 Hours.
Overview of production and characteristics of cultivated crops, perennial grasses, and woody species as feedstocks for bioenergy. Fundamentals of plant growth factors, culture, harvest and storage, quality and improvement, and introduction to environmental impact, modeling, and resource utilization. Prerequisite: MATH 1203 and BIOL 1543 or CSES 1203. Courses in introductory chemistry or soil science are preferred. (Typically offered: Spring)

CSES 4553. Wetland Soils. 3 Hours.
This course explains the chemical, physical, and morphological characteristics of wetland soils and describes the techniques for identifying wetland soils using field indicators and monitoring equipment. This course also explains principles of wetland creation, restoration, and mitigation - all key components in assuring the sustainability of valuable wetland resources. Prerequisite: CSES 2203 and CSES 2201L or CSES 355V. (Typically offered: Spring Odd Years)

CSES 462V. Internship. 1-6 Hour.
Supervised practical work experience in agronomy and environmental science to develop and demonstrate professional competence. Faculty approval of project proposal prior to enrollment and written and oral reports after the project is complete are required. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.