

**CROP AND SOIL SCIENCES**

**CSS**

**Department of Plant, Soil and Microbial Sciences  
College of Agriculture and Natural Resources**

**101 Introduction to Crop Science**  
Fall. 3(2-2) R: Open to undergraduate students or agricultural technology students.

Principles of crop production including crop and soil management and improvement. International and sustainable agriculture. Water quality issues.

**105 Agricultural Industries Seminar**  
Fall. 1(2-0) R: Open to agricultural technology students in the Agricultural Industries Major. SA: AEE 105

Preparation for academic and professional success. Introduction to opportunities in the agriculture industry.

**110 Computer Applications in Agronomy**  
Fall. 2(1-2) R: Open to undergraduate students or agricultural technology students in the College of Agriculture and Natural Resources. Not open to students with credit in CSE 101.

Use of computers in agriculture. Basic computer operating systems. Management and use of storage media. Laboratory experience in word processing, spreadsheets, databases, programming languages, networking, and software related to agriculture.

**120 Agricultural Industry Issues**  
Fall. 3(3-0) R: Open to undergraduate students or agricultural technology students.

Issues facing the agricultural industry. Role of government in addressing these issues.

**124 Introduction to Sustainable Agriculture and Food Systems**

Fall, Spring. 1(0-2) Interdepartmental with Environmental Studies and Agriscience and Horticulture. Administered by Crop and Soil Sciences. R: Open to undergraduate students or agricultural technology students.

Impact of agricultural and social sciences on our food system. Contemporary research and movements involving agricultural and food system sustainability.

**135 Crop Scouting and Investigation**  
Spring. 2(3-0) Interdepartmental with Horticulture. Administered by Crop and Soil Sciences. P: CSS 101 or HRT 203 R: Open to undergraduate students or agricultural technology students.

Crop production, pest scouting and other production problems, and field diagnoses. Interaction with agriculture clientele. Offered first ten weeks of semester.

**151 Seed and Grain Quality**  
Spring. 2(2-2) R: Open to undergraduate students or agricultural technology students. SA: CSS 051

Principles and practices of producing, conditioning, testing and marketing field crop seed. Grain grading and quality evaluation. Offered first ten weeks of semester.

**171 Operations Budgeting for Golf Course Managers**  
Spring. 2(3-0) RB: CSS 232 and CSS 210 SA: CSS 071

Budgeting. Financial analysis. Purchasing and materials management for golf course operations. Offered first ten weeks of semester.

**178 Turfgrass Irrigation**  
Spring. 3(3-2) P: CSS 232

Turfgrass irrigation systems. Installation and maintenance including water management. Offered first ten weeks of semester.

**181 Pesticide and Fertilizer Application Technology**  
Spring. 3(3-3) SA: CSS 081

Effective and efficient application of pesticides and fertilizers to turf and ornamentals. Pesticide handling, legal, and environmental concerns. Calibration of equipment. Offered first ten weeks of semester.

**192 Professional Development Seminar I**  
Spring. 1(0-2) R: Open to students in the Department of Plant, Soil and Microbial Sciences.

Career development, critical issues analysis, resume writing, scientific presentations and public speaking in crop and soil sciences.

**201 Forage Crops**  
Fall. 3(2-2) R: Open to undergraduate students or agricultural technology students.

Forage crop production, management, and utilization; crop identification; soil fertilization; planting and harvesting of grasses and legumes.

**202 World of Turf**  
Fall, Spring, Summer. 2(2-0) Not open to students with credit in CSS 232.

Role of turf in society and the environment. Principles underlying establishment and maintenance of turf on athletic fields, parks, home lawns, and golf courses. Aesthetic, safety, and economic aspects of turfgrass management practices.

**202L World of Turf Lab**  
Fall. 1(0-2) P: CSS 202 or concurrently Not open to students with credit in CSS 232.

Turfgrass identification. Site analysis and recommendations. On campus facility and venue visits. Mowing equipment and practices. Turf establishment. Soil cultivation and amendments. Fertilizer and pest management. Field trips required.

**203 Applied Turf Management**  
Fall. 1(1-0) P: CSS 202 or concurrently Not open to students with credit in CSS 232.

Principles and practices for establishing and maintaining turf in residential and commercial lawns. Field trips required.

**210 Fundamentals of Soil Science**  
Fall, Spring. 3(2-3) RB: CEM 141 R: Open to undergraduate students or agricultural technology students.

Agricultural and natural resource ecosystems: soil, vegetation, and ground water components. Energy, water, and nutrient cycles. Soil classification and mapping. Land management and use issues.

**212 Advanced Crop Production**  
Fall. 2(2-0) P: CSS 101 RB: CSS 210 and CSS 110 R: Open to undergraduate students or agricultural technology students.

Systems approach to production of field crops including corn, soybeans, small grains, sugar beets, and dry beans.

**222 New Horizons in Biotechnology**  
Fall. 2(2-0) Interdepartmental with Entomology. Administered by Crop and Soil Sciences. R: Open to undergraduate students or agricultural technology students.

Perspectives on biotechnology for safer food production, environmental quality, and improved human health. Impacts of biotechnology on the national economy. Political and ethical ramifications of applied biotechnology.

**232 Turfgrass Management**  
Fall. 4(3-2) P: CSS 210 or concurrently RB: CSS 110 or CSE 101

Turfgrass utilization, identification, establishment and management principles. Responses to various cultural practices.

**251 Organic Farming Principles and Practices**  
Spring. 3(3-0) Interdepartmental with Horticulture. Administered by Horticulture.

History and principles of organic farming. Farms as ecological systems. Certification process and agencies. Organic matter management, the soil food web, and nutrient availability. Biodiversity, crop rotations, plant competition, ground cover, and plant health. Integrating crops and animals. Organic animal husbandry. Field trip required.

**262 Turfgrass Management Seminar**  
Fall. 1(2-0) A student may earn a maximum of 2 credits in all enrollments for this course. P: CSS 232 or concurrently

Presentations by turf students and industry professionals. Topics include internship experiences, technical expertise, and keys to successful career pathways.

**264 Golf Course Design and Construction Techniques**  
Fall. 2(2-0) P: CSS 210 and CSS 232 and CSS 267 SA: CSS 164

Concepts and theory of golf course design and construction including location, space, topography, clientele, and environmental concerns.

**267 Performance Turf Design and Construction**  
Spring. 2(2-2) P: CSS 232

Performance turfgrass design, construction, renovation and establishment principles.

**269 Turfgrass Strategies: Integration and Synthesis**  
Spring. 2(3-0) P: CSS 232 and CSS 267

Issues in turfgrass management including employee relations, cultural, and environmental problems. Offered first ten weeks of semester.

**272 Turfgrass Soil Fertility**  
Spring. 2(3-0) RB: CSS 210 SA: CSS 044, CSS 342

Soil-plant relationships, soil acidity and alkalinity, macro- and micro-nutrients, fertilizer materials, soil fertility, evaluations, and fertilizer programming. Offered first ten weeks of semester.

**290 Independent Study in Crop and Soil Science**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to students in the Institute of Agricultural Technology. SA: CSS 057

Field, laboratory, or library research problems.

## Crop and Soil Sciences—CSS

- 292 Management of Turfgrass Weeds**  
Fall. 3(2-2) P: CSS 232 RB: PLB 105  
Chemical, biological, and cultural methods of managing cool- and warm-season turfgrass weeds. Environmental considerations in weed management.
- 294 Issues in International Agriculture**  
Spring. 1(1-0) P: Completion of Tier I Writing Requirement R: Open to undergraduate students or agricultural technology students. SA: CSS 494  
Global issues related to food production, soil resources and sustainability of agriculture in developing and developed countries.
- 302 Principles of Weed Management**  
Fall. 3(2-2) P: CSS 101 or PLB 105 or BS 161 or HRT 203 or CSS 232 or LB 145 R: Open to undergraduate students or agricultural technology students. SA: CSS 402, CSS 156  
Cultural, mechanical, biological, and chemical weed management principles and practices. Environmental considerations. Field trips required.
- 330 Soil Chemistry**  
Spring. 2(2-2) P: CSS 210 and CEM 143  
Organic and inorganic soil processes including mineralogy, adsorption, desorption, and precipitation. Chemistry of soil organic matter and inorganic soil components.
- 340 Applied Soil Physics**  
Spring. 2(2-2) P: CSS 210  
Soil physical properties including solids, water, air, and heat. Transport processes in soil.
- 350 Introduction to Plant Genetics**  
Spring. 3(4-0) P: PLB 105 or BS 161 R: Not open to freshmen or sophomores.  
Fundamentals of plant genetics with applications to agriculture and natural resources.
- 360 Soil Biology**  
Fall. 3(2-2) P: CSS 210 RB: CSS 330  
Overview of organismal diversity and biological soil processes. Role of macroorganisms and microorganisms in soil processing, including nutrient cycling.
- 382 Turfgrass Physiology**  
Spring. 2(3-0) Interdepartmental with Horticulture. Administered by Crop and Soil Sciences. P: (CSS 232) Completion of Tier I writing requirement. RB: PLB 105 SA: CSS 282, CSS 068, CSS 332  
Physiological principles of turfgrass growth and development. Water relations, light, temperature, respiration, photosynthesis, mineral nutrition, and hormone action. Impact of mowing, cultivation, and traffic on turfgrass growth. Offered first ten weeks of semester.
- 424 Sustainable Agriculture and Food Systems: Integration and Synthesis**  
Fall. 3(3-0) Interdepartmental with Environmental Studies and Agriscience and Horticulture. Administered by Crop and Soil Sciences. P: CSS 124 RB: (CSS 101 or CSS 360 or CSS 431 or ENT 479 or HRT 203 or HRT 251 or HRT 341 or EEP 255 or EEP 260 or ESA 343) or (ESA 444 or GEO 410) R: Open to juniors or seniors or graduate students.  
Biogeochemical and socio-economic aspects of food, fiber, and fuel production. Environmental impacts and social context. Experiential learning projects.
- 425 Microbial Ecology**  
Spring. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. Administered by Microbiology and Molecular Genetics. RB: MMG 301 SA: MPH 425  
Microbial population and community interactions. Microbial activities in natural systems, including associations with plants or animals.
- 431 International Agricultural Systems**  
Spring. 3(3-0) P: ANR 250 or EEP 260 or ISS 310 or ISS 315 or ISS 318 or ISS 320 or ISS 330A or ISS 330B or ISS 330C or ISS 336 R: Not open to freshmen.  
World production capacity for food, fiber and biofuel as related to soil, biology and climatic resources. Principles and case studies of sustainable systems presented from developing and developed countries. Emerging issues in agricultural globalization and biodiversity.
- 441 Plant Breeding and Biotechnology**  
Spring of even years. 3(3-0) Interdepartmental with Forestry and Horticulture. Administered by Crop and Soil Sciences. P: CSS 101  
Plant improvement by genetic manipulation. Genetic variability in plants. Traditional and biotechnological means of creating and disseminating recombinant genotypes and cultivars. Importance of plant breeding to our food system, economy, and environment.
- 442 Agricultural Ecology**  
Fall. 3(3-0) R: Open to juniors or seniors or graduate students.  
Ecological principles in the design and management of agricultural ecosystems. Integration of ecological factors regulating crop and rangeland productivity.
- 445 Evolution (W)**  
Fall. 3(3-0) Interdepartmental with Plant Biology and Zoology. Administered by Zoology. P: (ZOL 341 or CSS 350) and completion of Tier I writing requirement R: Not open to freshmen. SA: ZOL 345  
Processes of evolutionary change in animals, plants, microbes. Population genetics, microevolution, speciation, adaptive radiation, macroevolution. Origin of Homo sapiens.
- 451 Biotechnology Applications for Plant Breeding and Genetics**  
Spring. 3(2-2) Interdepartmental with Forestry and Horticulture. Administered by Crop and Soil Sciences. RB: (CSS 350 or ZOL 341) and CSS 441  
Principles, concepts, and techniques of agricultural plant biotechnology. Recombinant DNA technology, plant molecular biology and transformation in relation to plant improvement.
- 452 Watershed Concepts**  
Fall, Spring, Summer. 3(3-0) Interdepartmental with Biosystems Engineering and Environmental Studies and Agriscience and Forestry and Fisheries and Wildlife. Administered by Environmental Studies and Agriscience. P: ESA 324 and ZOL 355 RB: organic chemistry SA: RD 452  
Watershed hydrology and management. The hydrologic cycle, water quality, aquatic ecosystems, and social systems. Laws and institutions for managing water resources.
- 455 Environmental Pollutants in Soil and Water**  
Spring. 3(3-0) P: CEM 143 or CEM 251 RB: CSS 210 R: Open to juniors or seniors or graduate students.  
Environmental sources, physiochemical and biological processes, management of plant nutrients, heavy metals, organic contaminants, pesticides and pharmaceuticals in soil and water.
- 464 Statistics for Biologists**  
Fall. 3(3-0) Interdepartmental with Animal Science and Statistics and Probability. Administered by Statistics and Probability. RB: STT 421  
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.
- 467 BioEnergy Feedstock Production**  
Fall. 3(3-0) Interdepartmental with Biosystems Engineering and Forestry. Administered by Crop and Soil Sciences. P: MTH 103 or MTH 116 or MTH 124 or MTH 132 or LB 118 or MTH 152H RB: CSS 101 and CSS 210  
Agronomic, economic, technological, and environmental principles involved in bioenergy feedstock production. Cultivation, harvest, transportation, and storage of agricultural and forest biomass.
- 470 Soil Resources**  
Fall. 3(2-3) RB: CSS 210 R: Not open to freshmen or sophomores.  
Evaluation of the properties, genesis, and classification of soil resources to assist in making land-use decisions.
- 477 Pesticides in Pest Management**  
Fall of even years. 3(3-0) Interdepartmental with Entomology and Horticulture. Administered by Entomology. P: PLP 405 or CSS 302 or ENT 404 or ENT 470 RB: CEM 143 or CEM 251 R: Open to juniors or seniors or graduate students.  
Chemistry, modes of action, product development and regulation of pesticides. Environmental and social aspects of pesticide use.
- 478 Integrated Pest Management (W)**  
Spring of odd years. 3(3-0) Interdepartmental with Entomology and Forestry and Horticulture. Administered by Entomology. P: (ENT 404 or ENT 470 or PLP 405 or CSS 302) and completion of Tier I writing requirement  
Theory, philosophy and application of pest management focusing on agricultural and natural systems.
- 480 Soil Fertility and Management**  
Fall. 3(3-0) P: CSS 101 and CSS 330 and CSS 340 and CSS 360 and (CSS 470 or concurrently)  
Comprehensive management of agricultural soils. Soil fertility, including liming and fertilizer materials and other nutrient sources. Site specific soil management. Environmental impacts including soil erosion, runoff, and organic matter mineralization.

- 486 Biotechnology in Agriculture: Applications and Ethical Issues**  
Fall of even years. 3(3-0) Interdepartmental with Forestry and Horticulture and Philosophy. Administered by Horticulture. P: BS 161 or PLB 105 RB: CSS 350 or ZOL 341 R: Not open to freshmen or sophomores.  
Current and future roles of biotechnology in agriculture: scientific basis, applications. Environmental, social, and ethical concerns.
- 488 Agricultural Cropping Systems: Integration and Problem Solving**  
Spring. 3(2-2) P: (CSS 101 and CSS 210) and completion of Tier I writing requirement. RB: (PLP 405 and ENT 404) and Course work in crop production and management. R: Open to seniors in the College of Agriculture and Natural Resources.  
Integration and synthesis of agronomic and related concepts in agricultural cropping systems. Problem solving and application of information.
- 490 Independent Study**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: CSS 101 or CSS 210 R: Approval of department; application required.  
Individual work on field, laboratory, or library research problem of special interest to the student.
- 491 Special Topics**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: CSS 101 or CSS 210  
Topics from crop production, crop physiology, turfgrass management, organic soils, turfgrass soils, soil fertility, plant and soil relationships, genetics, biotechnology, environmental science, or sustainable agriculture.
- 492 Professional Development Seminar II**  
Fall. 1(0-2) P: (CSS 192 or CSS 262) and (CSS 210 and completion of Tier I Writing requirement) R: Open to seniors in the Department of Plant, Soil and Microbial Sciences.  
Synthesis, integration and application of agronomic principles to current issues in agronomy via discussion and oral and written communication.
- 493 Professional Internship in Crop and Soil Sciences**  
Fall, Spring, Summer. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, ANR 493, ANS 493, CMP 493, CSS 493, EEP 493, ESA 493, FIM 493, FSC 493, FW 493, HRT 493, PKG 493, PLP 493 and PRR 493. P: Completion of Tier I writing requirement. R: Approval of department; application required.  
Supervised professional experiences in agencies and businesses related to crop and soil sciences and environmental soil sciences.
- 499 Undergraduate Research**  
Fall, Spring, Summer. 3(0-9) R: Approval of department; application required.  
Faculty supervised research in a selected area of crop and soil sciences or environmental soil science.
- 802 Weed Biology**  
Spring of even years. 2(2-0) RB: A previous course in weed science or plant biology or ecology.  
Weed biology, including weed seed production and dispersal and seed fate. Weed life history traits and ecophysiology, including invasive species. Data collection in weed ecology research.
- 805 Herbicide Action and Metabolism**  
Spring of odd years. 2(2-0)  
Properties and characteristics of herbicides. Processes involved in herbicide action, transport, and fate in plants and soils.
- 814 Advanced Statistics for Biologists**  
Spring. 4(3-2) Interdepartmental with Animal Science and Statistics and Probability. Administered by Statistics and Probability. RB: STT 464  
Concepts of reducing experimental error for biological and agricultural research. Covariance, randomized block designs, latin squares, split plots, repeated-measures designs, regression applications, and response surface designs. Analyses using statistical software.
- 819 Advanced Plant Breeding**  
Fall of even years. 3(3-0) Interdepartmental with Forestry and Horticulture. Administered by Horticulture. RB: STT 422 and ZOL 341  
Genetic expectations resulting from breeding strategies with cross- and self-pollinated crop plants. Germplasm collections, mapping populations, and modifications of reproductive biology useful for crop improvement.
- 820 Plant Reproductive Biology and Polyploidy**  
Spring of odd years. 1(3-0) Interdepartmental with Forestry and Horticulture and Plant Biology and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology  
Genetic processes underlying variations in plant reproductive biology and polyploidy. Utilization of these characteristics in plant breeding.
- 821 Crop Evolution**  
Spring of odd years. 1 credit. Interdepartmental with Forestry and Horticulture and Plant Biology and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology  
Cultural and biological aspects of the evolution of domestic plants.
- 822 Historical Geography of Crop Plants**  
Spring of odd years. 1 credit. Interdepartmental with Forestry and Horticulture and Plant Biology and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology  
Development and spread of the major crop species.
- 840 Soil Physics**  
Fall of odd years. 3(2-3) R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.  
Physical properties of soil including texture, structure, consistency, aeration, moisture content, and temperature. Quantitative measurement of plant growth. Agronomic and engineering practices.
- 842 Population Genetics, Genealogy and Genomics**  
Fall. 3(3-0) Interdepartmental with Animal Science and Forestry and Fisheries and Wildlife and Genetics and Horticulture. Administered by Forestry. RB: Pre-calculus, basic genetics  
Population genetic processes underlying patterns of molecular genetic variation. Genealogical approaches to the study of genomic diversity, phylogenetic reconstruction, and molecular ecology.
- 850 Soil Chemistry**  
Spring. 3(3-3) R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.  
Ion activities, ionic exchange and equilibrium reactions. Soil pH, macro- and micronutrients, saline soils and availability of nutrients to plants.
- 853 Plant Mineral Nutrition**  
Fall of odd years. 3(3-0) Interdepartmental with Horticulture. Administered by Horticulture. RB: PLB 301  
Inorganic ion transport in plant cells and tissues. Physiological responses and adaptation to problem soils. Genetic diversity in nutrient uptake and use by plants. Physiological roles of elemental nutrients in crop growth.
- 856 Plant Molecular and Omic Biology**  
Spring. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology and Plant Biology. Administered by Plant Biology. RB: ZOL 341 SA: BOT 856  
Recent advances in genetics and molecular biology of higher plants.
- 865 Environmental Fate of Organic Contaminants in Soils**  
Spring of even years. 3(3-0) RB: Undergraduate level coursework in general and organic chemistry, and introductory microbiology  
Chemistry and biology of toxicants in soils as determinants of environmental fate.
- 880 Scientific Communication and Professional Development**  
Spring. 1(0-2)  
Interactive professional experiences including grant preproposal preparation and presentation, scientific presentations, mock position interviews, and resume preparation.
- 890 Independent Study**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.  
Individual study on field, laboratory, or library research.
- 891 Current Topics in Ecology and Evolution**  
Summer. 1 to 2 credits. A student may earn a maximum of 10 credits in all enrollments for this course. Interdepartmental with Plant Biology and Zoology. Administered by Zoology.  
Presentation and critical evaluation of theoretical and empirical developments in ecology and evolutionary biology by visiting scientists.

## Crop and Soil Sciences—CSS

### **891B Selected Topics in Plant Breeding and Genetics**

Fall, Spring, Summer. 1 to 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Forestry and Horticulture. Administered by Horticulture. R: Open only to graduate students in the Plant Breeding and Genetics major or Genetics major. Approval of department.

Selected topics in plant breeding.

### **892 Plant Breeding and Genetics Seminar**

Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Forestry and Horticulture. Administered by Horticulture.

Experience in review, organization, oral presentation, and analysis of research.

### **892B Ecological Food and Farming Systems Seminar**

Fall, Spring. 1 credit. Interdepartmental with Community, Agriculture, Recreation and Resource Studies. Administered by Crop and Soil Sciences.

Experiential learning, and multidisciplinary and applied research, in ecological food and farming systems.

### **893 Selected Topics**

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open to graduate students in the College of Agriculture and Natural Resources or in the College of Engineering or in the College of Natural Science.

Selected topics in crop and soil sciences of current interest and importance.

### **899 Master's Thesis Research**

Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open to masters students in the Department of Plant, Soil and Microbial Sciences.

Master's thesis research.

### **921 Geostatistics**

Fall of odd years. 3(3-0) RB: Statistical methods or approval of department. Working knowledge of SAS software.

Spatial variability analysis. Variogram models. Kriging and cokriging. Field experiments with spatial trends. Longitudinal data. Modeling in the presence of spatial and temporal correlations.

### **941 Quantitative Genetics in Plant Breeding**

Spring of even years. 3(2-2) Interdepartmental with Forestry and Horticulture. Administered by Crop and Soil Sciences. RB: CSS 819 and STT 464

Theoretical and genetic basis of statistical analysis of quantitative traits using genetic markers. Computational tools for the study of quantitative traits.

### **999 Doctoral Dissertation Research**

Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open to doctoral students in the Department of Plant, Soil and Microbial Sciences.

Doctoral dissertation research.