

CROP AND SOIL ENVIRONMENTAL SCIENCE (CSES)

CSES 2224 - Foundations of Precision Agriculture (3 credits)

Integrated technologies in the plant and environmental sciences including: global positioning systems (GPS), geographic information systems (GIS), remote and proximal sensing, variable rate technology (VRT) and decision support systems (DSS). Application to site-specific nutrient, water, weed and disease management.

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 2244 - Agriculture, Global Food Security and Health (3 credits)

Agriculture and food security within the larger context of applied agronomy, gender role, cultural and political aspects of food production, food policy, production constraints, and global population growth. Emphasis on gender inequity and globalized food systems will be made. Service learning experience both local and global to promote career opportunity in international development.

Pathway Concept Area(s): 4 Reasoning in Natural Sci., 10 Ethical Reasoning, 11 Intercultural&Global Aware.

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 2434 - Crop Evaluation (2 credits)

Identification of more than 200 crops, weeds, seeds and crop diseases. Seed testing for purity according to the rules of the Association of Official Seed Analysts. Crops graded according to the official USDA grain grading standards.

Instructional Contact Hours: (6 Lab, 2 Crd)

CSES 2444 - Agronomic Crops (3 credits)

An introduction to crop production in Virginia, presenting basic climatic, crop, and soil characteristics and their relation to cropping systems. Introduces basic mechanical, chemical, and managerial tools of crop production and examines feed quality and seed and forage storage.

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 2564 - Turfgrass Management (3 credits)

Growth, development, adaptation, and selection of the major turfgrass species. Principles of establishment, mowing, nutrition, irrigation, cultivation, and pest control of lawns and utility turfs.

Corequisite(s): BIOL 1105

Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

CSES 2964 - Field Study (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 2974 - Independent Study (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 2984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 2994 - Undergraduate Research (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 3114 - Soils (3 credits)

Characterization of soils as a natural resource emphasizing their physical, chemical, mineralogical, and biological properties in relation to nutrient availability, fertilization, plant growth, land-use management, waste application, soil and water quality, and food production. For CSES, ENSC, and related plant-and earth-science majors. Partially duplicates 3134.

Prerequisite(s): CHEM 1036

Corequisite(s): CSES 3124

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: GEOS 3614

CSES 3124 - Soils Laboratory (1 credit)

Parent materials, morphology, physical, chemical, and biological properties of soils and related soil management and land use practices will be studied in field and lab. Partially duplicates 3134.

Corequisite(s): CSES 3114

Instructional Contact Hours: (3 Lab, 1 Crd)

Course Crosslist: GEOS 3624

CSES 3144 - Soil Description and Interpretation (3 credits)

Describing, classifying, evaluating, and interpreting soil and site properties in the class and field. Local field trips supplement lecture and laboratory studies. Required for students interested in attending soil judging contests.

Corequisite(s): CSES 3114, CSES 3124

Instructional Contact Hours: (1 Lec, 6 Lab, 3 Crd)

CSES 3304 - Geomorphology (3 credits)

Examines the variety of landforms that exist at the earth's surface. Detailed investigation of major processes operating at the earth's surface including: tectonic, weathering, fluvial, coastal, eolian, and glacial processes. Field excursion.

Prerequisite(s): GEOG 1104 or GEOS 1004 or GEOS 2104

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: GEOG 3304, GEOS 3304

CSES 3564 - Golf and Sports Turf Management (3 credits)

Principles of turfgrass science and culture required for successful establishment and management of intensely utilized fine golf and sports turf surfaces. Pre: CSES 3564 or equivalent turfgrass science fundamentals course from transfer institution.

Prerequisite(s): CSES 2564

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 3614 - Soil Physical and Hydrological Properties (3 credits)

Soil physical and mechanical properties and the physical processes controlling soil water retention and flow in agronomic and natural settings. Grain size distribution, weight-volume relationships, specific surface, electrical charge density, consistency, stress, compaction, rainfall runoff, water retention, steady/non-steady water flow in saturated/unsaturated soil, infiltration, bare soil evaporation, and soil water balance.

Prerequisite(s): (CSES 3114 and CSES 3124) or (GEOS 3614 and GEOS 3624)

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 3954 - Study Abroad (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 3984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 4064 - Soil Microbiology (3 credits)

Soil microbes as determinants of plant growth, sustainable agricultural systems, and global nutrient cycles. Environmental controls of soil microbes and relationship to soil decomposition. Soil as a micro-habitat. Application to soil management and plant growth, plant-microbe mutualisms, probiotics, biocontrol, composting, ecosystem restoration, and disease suppression.

Prerequisite(s): BIOL 1105 and (CSES 3114 or ENSC 3114 or GEOS 3614) or (CSES 3134 or ENSC 3134)

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4134 - Soil Genesis and Classification (3 credits)

Formation of soils across landscapes, soil-forming factors and processes, applied soil geology/geomorphology, applied soil biochemistry, soil hydrology, diagnostic horizons and characteristics used in Soil Taxonomy; soil classification and mapping. Three outdoor lectures and one 3-day field trip are mandatory.

Prerequisite(s): (CSES 3114 and CSES 3124) or (ENSC 3114 and ENSC 3124) or (GEOS 3614 and GEOS 3624) or CSES 3134 or ENSC 3134

Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

CSES 4144 - Plant Breeding and Genetics (3 credits)

Genetic variation in plants and its importance in plant breeding, and comparisons of theories and procedures in breeding of self-pollinated versus cross-pollinated plants.

Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

CSES 4174 - Soil Evaluation and Sampling (3 credits)

Naming, describing, classifying, sampling, and interpreting soil and site properties in the field to assess environmental impacts and suitability under specific land use scenarios. Selecting and evaluating sites of representative soil resources across the landscape using accepted professional protocols, simulating workplace responsibilities and performance. Local and regional field trips and sampling projects provide professional skill development evaluated by practitioners and potential employers.

Prerequisite(s): CSES 3114 or CSES 3144

Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

CSES 4214 - Soil Fertility and Management (3 credits)

Soil productivity and nutrients required for crop growth; fertilizer sources and nutrient reactions in soil; methods of fertilizer nutrient placement in major tillage systems; and interpretation of soil tests and plant analyses for determining crop nutrient requirements.

Prerequisite(s): CSES 3114 or CSES 3134

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4224 - Applied Concepts in Precision Agriculture (3 credits)

Advanced applications of core components and technologies used for integrated plant and environmental studies. Global Navigation Satellite Systems (GNSS), remote sensing technologies, Geographic Information Systems (GIS), soil sampling, yield monitoring, and analysis and decision-making systems applied for site specific management of production agriculture resources.

Prerequisite(s): CSES 2224

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4234 - Agro Data Integration (3 credits)

Data science applications in the agricultural sciences. Data pipelines and modern Linux, cluster and cloud-based computing environments. Command line interface and shell scripting. Programming and data processing in Python programming language. Data analysis and visualization in R programming language. Agronomic data analysis and data mining.

Prerequisite(s): CSES 2224 and CS 1014

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4324 - Water Quality Laboratory (1 credit)

Teach students a variety of laboratory chemical and biological techniques for water quality analysis. Complementary to ENSC/CSES 4314.

Prerequisite(s): CHEM 1046

Corequisite(s): CSES 4314, ENSC 4314

Instructional Contact Hours: (3 Lab, 1 Crd)

Course Crosslist: ENSC 4324

CSES 4334 - Principles and Practice of Agroforestry (3 credits)

Biological, social, economic, and technical aspects of agroforestry, training and technology transfer techniques, and application of forestry and agriculture principles. Roles of animals and fish, trees, and agricultural crops in agroforestry systems. Community involvement in planning and implementation of agroforestry projects.

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: FREC 4334

CSES 4344 - Crop Physiology and Ecology (3 credits)

Developmental and ecological processes important in cropping situations: seed physiology, root and canopy development, flowering, water stress, energy flow, competition; emphasis on physiological adaptations, limitations to yield, and yield-optimizing strategies.

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4354 - Advanced Agronomic Crops (3 credits)

Survey of major agronomic crops grown in the Eastern US and their production including: corn, soybean, wheat, barley, cotton, peanut, tobacco and alfalfa. Covers impact of environmental conditions and management on crops, resource requirements for productivity, and effects on soil resources.

Prerequisite(s): CSES 2444

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4444 - Managed Ecosystems, Ecosystem Services, and Sustainability (3 credits)

Description and interactions of climate, soils, and organisms within intensively managed ecosystems used to produce food, fiber, bioenergy, fresh water, recreation, cultural, and other ecosystems services essential for human well-being. Ecological concepts applied to agricultural, grassland, and urban/turf ecosystems. Ecologically-based principles for sustainably managed ecosystems. Regional and global significance of managed ecosystems in context of sustainable food systems, and the Millennium Ecosystem Assessment. Pre-Requisite: Junior Standing required.

Prerequisite(s): CSES 3114 or CSES 3134

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: ENSC 4444

CSES 4524 - Drone Applications in Ag Systems (3 credits)

Unmanned Aerial Systems (UAS) or drones as an advanced remotely sensed technology to collect ultra-high spatial resolution images. Components of drones and sensors. UAS operational concepts, and legal requirements, principles of drone data collection and drone platforms. Overview of data processing software and generation of land maps from drone photogrammetry. Image analysis to make recommendations for water, nutrient and pesticide applications.

Prerequisite(s): CSES 2224

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4534 - Internet of Things (IoT) for Smart Farming (3 credits)

Internet of Things (IoT) technology in the plant and environmental sciences and applications to smart-farming ecosystems and agricultural industry. IoT platforms and systems used in smart farming programs related to field equipment management, IoT components, data management, and cybersecurity. Applying wireless sensors, controllers, computers, actuators, and software via wireless network devices.

Prerequisite(s): CSES 2224

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4544 - Forage Crop Ecology (3 credits)

Species adaptation interrelated with soil, climatic, and biotic factors as associated with establishment, production, utilization, and nutritional value of forages.

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4644 - Land-based Systems for Waste Treatment (3 credits)

Soils as a medium for waste treatment; potential for environmental degradation from biologicals and chemicals added to soils; development of land-based treatment and utilization systems for solid and liquid wastes; issues and concerns relating to large-scale applications of municipal and industrial wastes to land.

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4854 - Wetland Soils and Mitigation (3 credits)

Wetland soils as components of natural landscapes: biogeochemistry, hydrology, geomorphology, hydric soil indicators, and wetlands functions under various land uses. Soil and hydrologic factors important to wetland delineation and jurisdictional determination. Mitigation of wetland impacts with emphasis on restoration and creation. Outdoor lectures at local wetlands and a two-day long field trip to observe and identify wetland soils are mandatory.

Prerequisite(s): (CSES 3114 and CSES 3124) or (ENSC 3114 and ENSC 3124) or (GEOS 3614 and GEOS 3624) or CSES 3134 or ENSC 3134

Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

CSES 4864 - Capstone: Crop & Soil Sciences (3 credits)

Experiential and discussion-based learning that utilizes prior knowledge gained in the major to synthesize information, and prepare a written comprehensive work plan that is defended orally. Review available careers in the crop and soil sciences. Compose and critique resumes and cover letters. CSS majors only. Pre: Senior standing.

Instructional Contact Hours: (3 Lec, 3 Crd)

CSES 4964 - Field Study (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 4974 - Independent Study (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 4984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

CSES 4994 - Undergraduate Research (1-19 credits)

Instructional Contact Hours: Variable credit course