

DEPARTMENT OF SOIL AND CROP SCIENCES

We develop the AgroEcosystems of tomorrow, transforming environmental challenges into opportunities

Since the Department of Soil and Crop Sciences awarded its first degree in 1911, we have made important contributions to agricultural sciences and the education of thousands of students. Today, our research, education, outreach, and extension activities are more important than ever, and remain at the core of the land grant mission of Colorado State University.

This is an exciting time of rapid scientific and technological advancements that are poised to transform agriculture and environmental stewardship. Our department's strengths in crop breeding and genetics, crop production systems, soil ecology, microbiome sciences, precision agriculture, agriculture extension, and irrigation management lie at the nexus of some of the biggest challenges facing humanity including climate change, sustainable food production, soil degradation, and depletion of critical aquifers. The opportunity to play a leading role in developing solutions to these challenges drives our ambition, dedication, and creativity. We will achieve this vision through supporting an equitable, inclusive, and diverse community, and through close collaboration with our many stakeholders.

<https://agsci.colostate.edu/department/soil-and-crop-sciences/>

Undergraduate Majors

- Major in Soil and Crop Sciences (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major/>)
 - Plant Biotechnology Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-plant-biotechnology-concentration/>)
 - Soil Science and Environmental Solutions Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-science-environmental-solutions-concentration/>)
 - Sustainable Agricultural Management Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-sustainable-agricultural-management-concentration/>)
 - Agronomic Production Management Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-agronomic-production-management-concentration/>) (No new students are being admitted into this concentration)
 - Applied Information Technology Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-applied-information-technology-concentration/>) (No new students are being admitted into this concentration)

- International Soil and Crop Sciences Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-international-concentration/>) (No new students are being admitted into this concentration)
- Plant Biotechnology, Genetics, and Breeding Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-plant-biotechnology-genetics-breeding-concentration/>) (No new students are being admitted into this concentration. Students interested in this area of study should visit the Plant Biotechnology Concentration)
- Soil Ecology Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-ecology-concentration/>) (No new students are being admitted into this concentration. Students interested in this area of study should visit the Soil Science and Environmental Solutions Concentration)
- Soil Restoration and Conservation Concentration (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-restoration-conservation-concentration/>) (No new students are being admitted into this concentration. Students interested in this area of study should visit the Sustainable Agricultural Management Concentration)

Minors

- Minor in Agroecosystems (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/agroecosystems-minor/>)
- Minor in Soil Resources and Conservation (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-resources-conservation-minor/>)
- Minor in Soil Science (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-science-minor/>)
- Organic Agriculture Interdisciplinary Minor (<http://catalog.colostate.edu/general-catalog/university-wide-programs/interdisciplinary-studies/organic-agriculture-interdisciplinary-minor/>)

Certificate

- Certificate in Seed Science and Technology (<http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/certificate-seed-science-technology/>)

Change of Major

- Reach out to Chris Amerman (Chris.Amerman@colostate.edu) to schedule an appointment to change your major/minor. A **Change of Major form** is electronically submitted by an advisor to the Registrar's Office
- Individualized Appointment with Advisor. Link for Scheduling (<https://calendly.com/socr-advising/advising-appointment/?month=2023-06>)
- Courses to take if you are interested in the programs include SOCR 100, SOCR 210, and SOCR 240.
- Students should ideally declare a major within the first two years, but exceptions can be made depending on their previous coursework.

Graduate Graduate Programs in Soil and Crop Sciences

Programs in crop science, soil science, or plant genetics lead to Master of Science and Doctor of Philosophy degrees. Students interested in graduate work should refer to the Graduate and Professional Bulletin (<http://catalog.colostate.edu/general-catalog/graduate-bulletin/>) and the Department of Soil and Crop Sciences. (<http://soilcrop.agsci.colostate.edu/>)

Master's Programs

Master of Science in Soil and Crop Sciences, Plan A*
Master of Science in Soil and Crop Sciences, Plan B*

Ph.D.

Ph.D. in Soil and Crop Sciences*

* Please see department for program of study.

Courses

Soil and Crop Sciences (SOCR)

SOCR 100 General Crops Credits: 4 (3-2-0)

Course Description: Production and adaptation of cultivated crops; principles affecting growth, development, management, and utilization.
Prerequisite: None.

Registration Information: Must register for lecture and laboratory.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: Yes.

SOCR 171 Environmental Issues in Agriculture (GT-SS3) Credits: 3 (2-0-1)

Also Offered As: HORT 171.

Course Description: Historical development of agriculture; environmental consequences of modern food production and other cultural approaches to agriculture.

Prerequisite: None.

Registration Information: Must register for lecture and recitation. Credit not allowed for both HORT 171 and SOCR 171.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

Additional Information: Diversity, Equity, & Inclusion 1C, Human Behavior, Culture, or Social Frameworks (GT-SS3).

SOCR 177 Applied Information Technology in Agriculture Credit: 1 (1-0-0)

Course Description: Introduction to database and project management, GIS/GPS and remote sensing, as they apply to agriculture, the environment, and business management.

Prerequisite: None.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 192 Water in the West Credits: 3 (0-0-3)

Course Description: History and current status of water resources management and policy in the western United States.

Prerequisite: None.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 193 Pathways to Success Credit: 1 (0-0-1)

Course Description: Orientation to the functions and resources of the department and is designed to support the academic and social integration of incoming students.

Prerequisite: None.

Registration Information: Sections may be offered: Online.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 200 Seed Anatomy and Identification Credit: 1 (0-2-0)

Course Description: Principles of seed anatomy including reproduction, identification, and seed characteristics of plant families.

Prerequisite: None.

Registration Information: Sections may be offered: Online.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 201 Seed Development and Metabolism Credit: 1 (1-0-0)

Course Description: Basic processes controlling seed development, maturation, dormancy, storage, germination, and how these factors relate to seedling growth.

Prerequisite: None.

Registration Information: Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 210 Microbiome Roles in a Sustainable Earth (GT-SC2) Credits: 3 (3-0-0)

Course Description: Microorganisms are the most abundant living entities on earth. Examine the incredible ways that microbes affect our everyday lives and contribute to a sustainable planet.

Prerequisite: None.

Registration Information: Offered as an online course only. Credit not allowed for both GES 281A1 and SOCR 210.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

Additional Information: Biological & Physical Sciences 3A, Natural & Physical Sciences w/o lab (GT-SC2).

SOCR 221 Cropping Systems Field Experience Credit: 1 (0-4-0)

Course Description: Explore the evolution of farming practices from conventional tillage through newly emerging regenerative techniques.

Prerequisite: None.

Registration Information: This is a partial semester course. Required field trips.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: Yes.

SOCR 240 Introductory Soil Science Credits: 4 (3-2-0)

Course Description: Formation, properties, and management of soils emphasizing soil conditions that affect plant growth.

Prerequisite: CHEM 107 or CHEM 111.

Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.

Terms Offered: Fall, Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 300 Seed Purity Analysis Credits: 2 (0-4-0)

Course Description: Fundamentals for determining physical purity of a seed lot using established rules and procedures.

Prerequisite: None.

Registration Information: Written consent of instructor. Sections may be offered: Online.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 301 Seed Germination and Viability Credits: 2 (0-4-0)

Course Description: Seed viability tests including standard germination and tetrazolium, seed viability, dormancy, parameters of viability and evaluation.

Prerequisite: None.

Registration Information: Written consent of instructor. Sections may be offered: Online.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 310 Agronomic Plant and Seed Identification Credits: 2 (0-4-0)

Course Description: Evaluate characteristics needed to identify agronomic plant and seed species.

Prerequisite: BZ 104 or BZ 110 or BZ 120 or HORT 100 or LIFE 102 or SOCR 100.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 311 Seed Quality--Seed Production and Genetics Credit: 1 (1-0-0)

Course Description: Importance of seed production and genetics to seed quality. The value of seed quality to field crop production.

Prerequisite: None.

Registration Information: Offered as an online course only. Credit not allowed for both SOCR 311 and SOCR 380A2.

Terms Offered: Fall, Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 320 Sustainable Forage Management for Livestock Credits: 3 (3-0-0)

Course Description: Fundamentals of establishment, management, and utilization of cultivated forages including hay, silage, and pasture production.

Prerequisite: ANEQ 101 or BZ 110 or BZ 120 or LIFE 102 or LIFE 103 or SOCR 240.

Restriction: Must not be a: Freshman.

Registration Information: Sophomore standing.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: Yes.

SOCR 322 Principles of Microclimatology Credits: 3 (3-0-0)

Course Description: Principles of microclimatology including energy balance concepts for soil and vegetation surfaces, and their application.

Prerequisite: PH 100 to 499 - at least 3 credits.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 330 Principles of Genetics Credits: 3 (3-0-0)

Course Description: Transmission, population, and molecular genetics; practical applications.

Prerequisite: BZ 110 or BZ 120 or LIFE 102.

Registration Information: Sections may be offered: Online.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 331 Genetics Laboratory Credit: 1 (0-3-0)

Course Description: Experimental techniques in transmission and molecular genetics.

Prerequisite: SOCR 330, may be taken concurrently.

Terms Offered: Fall, Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 335 Applied Plant Genetics Credits: 3 (2-3-0)

Course Description: Focus on the foundations of plant genetics and provide hands-on experiences in the greenhouse and molecular biology laboratory. Introduction to bioinformatics programs/analyses. Develop a deeper understanding of topics including reproduction strategies, polyploidy, genome structure, and genetic mapping, specifically in plants.

Prerequisite: (BZ 110 or BZ 120 or LIFE 102 or LIFE 103) and (BZ 350 or SOCR 330).

Registration Information: Must register for lecture and laboratory.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: Yes.

SOCR 341 Microbiology for Sustainable Agriculture Credit: 1 (1-0-0)

Course Description: Functional roles and management of soil organisms in organic agriculture, emphasis on ecological interactions with plants and plant pathogens.

Prerequisite: SOCR 240.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 343 Composting Principles and Practices Credit: 1 (1-0-0)

Course Description: Fundamentals of compost production, use, and regulation.

Prerequisite: SOCR 240 and SOCR 350.

Term Offered: Fall (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 344 Crop Development Techniques Credits: 2 (2-0-0)

Course Description: Conventional and transgenic approaches to crop variety development.

Prerequisite: BZ 120 or LIFE 102 or LIFE 103.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 345 Diagnosis and Treatment in Organic Fields Credits: 2 (0-4-0)

Also Offered As: HORT 345.

Course Description: Field experience in diagnosis of pest and nutrient problems on organic farms and development of treatment recommendations.

Prerequisite: (BSPM 302 or BSPM 308 or BSPM 361) and (HORT 100 or SOCR 100) and (SOCR 240).

Registration Information: Credit not allowed for both SOCR 345 and HORT 345. Required field trips.

Term Offered: Summer (even years).

Grade Mode: Traditional.

Special Course Fee: Yes.

SOCR 350 Soil Fertility Management Credits: 3 (3-0-0)

Course Description: Managing soil fertility and fertilizers to meet plant nutrient requirements in an environmentally sound manner with emphasis on nutrient cycling.

Prerequisite: (CHEM 107 and CHEM 108 or CHEM 111 and CHEM 112) and (SOCR 240).

Registration Information: Sections may be offered: Online.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 351 Soil Fertility Laboratory Credit: 1 (0-2-0)

Course Description: Soil chemical analyses and development of fertilizer recommendations for crops.

Prerequisite: SOCR 350, may be taken concurrently.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: Yes.

SOCR 370 Climate-Smart Irrigation Principles Credits: 2 (2-0-0)

Course Description: Determination of irrigation water requirements based on the estimation of storage and movement of water in the soil-plant-atmosphere system. Emphasis on the plant micro-climate and its impacts on irrigation requirements.

Prerequisite: (BZ 120 or HORT 100 or SOCR 100) and (SOCR 240).

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 371 Climate-Smart Irrigation Management Credit: 1 (1-0-0)

Course Description: Management of irrigation systems for field crops with emphasis on climate adaptation, irrigation methods, irrigation scheduling, and strategies for water conservation.

Prerequisite: SOCR 370.

Registration Information: Required field trips.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 375 Soil Biogeochemistry Credits: 3 (3-0-0)

Course Description: The study of the biotic and abiotic factors that drive the physical, chemical, and biological processes and elemental cycling of in-situ soils. New theories and models are examined to understand soil biogeochemistry at the local to global scales.

Prerequisite: SOCR 240.

Registration Information: Sections may be offered: Online.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 377 Geographic Information Systems in Agriculture Credits: 3 (2-2-0)

Course Description: Introduction to geographic information systems and global positioning systems with applications to agriculture.

Prerequisite: SOCR 100 to 499 - at least 3 credits or CS 100 to 499 - at least 3 credits.

Registration Information: Credit not allowed for both SOCR 377 and SOCR 577. Required field trips.

Term Offered: Fall.

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 384 Supervised College Teaching Credits: Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Registration Information: A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 400 Soils and Global Change-Impacts and Solutions Credits: 3 (2-2-0)

Course Description: Foundations on the science of global change and its impact on soil processes and biota.

Prerequisite: (SOCR 240) and (LIFE 220 or LIFE 320).

Registration Information: Must register for lecture and laboratory. Required field trips.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 401 Greenhouse Gas Mitigation, Land Use, and Mgmt Credits: 3 (2-3-0)

Course Description: Introduction to greenhouse gas estimation methods and mitigation project development in the land use sector.

Prerequisite: SOCR 240.

Registration Information: Required field trips.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 405 Global Agriculture and Environmental Change Credits: 3 (3-0-0)

Also Offered As: ESS 405.

Course Description: Explore the past, present, and future of global agroecosystems in a changing environment. Examine a range of environmental issues facing agroecosystems around the world, including water management, climate change, air pollution, and land use change. Assess the history of agricultural development and the factors that determine food security, as well as what strategies could help create a more sustainable and food secure world.

Prerequisite: BSPM 302 or BSPM 308 or BSPM 361 or LAND 220 or LIFE 220 or LIFE 320.

Registration Information: Credit not allowed for both ESS 405 and SOCR 405.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 410 Seed Processes: Storage and Deterioration Credit: 1 (0-0-1)

Course Description: Environmental conditions and management factors influencing storage and deterioration of seeds, including physiological and biochemical changes.

Prerequisite: BZ 104 or BZ 105 or BZ 120.

Registration Information: Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 412 Seed Processes: Separation and Conditioning Credit: 1 (1-0-0)

Course Description: Understanding the physical process required to separate pure seed from contaminants and maintain viability.

Prerequisite: BZ 104 or BZ 105 or BZ 120.

Registration Information: Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 413 Seed Vigor Concepts and Testing Credits: 2 (2-0-0)

Course Description: Provide a basic understanding of the concept of seed vigor, methods for seed vigor testing, and the relationship of crop performance.

Prerequisite: SOCR 200 or SOCR 201.

Registration Information: Offered as an online course only. Credit not allowed for both SOCR 413 and SOCR 481A1.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 415 Pollinator Management in Agroecosystems Credits: 2 (2-0-0)

Also Offered As: BSPM 415.

Course Description: Fundamental concepts of pollinator biology and management, sustainable crop-pollinator interactions, regional and global issues on pollinator management and conservation, best management practices for commercially managed pollinators.

Prerequisite: HORT 100 or SOCR 100.

Registration Information: Junior standing. Credit not allowed for both SOCR 415 and BSPM 415. Required field trips.

Term Offered: Spring (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 421 Agroecosystem Management Credits: 4 (3-2-0)

Course Description: Broad focus on soil and crop management in agricultural systems, with an emphasis on the driving biophysical factors, processes and interactions. Emphasis on integrating concepts and knowledge from previous courses and applying this knowledge toward an interdisciplinary analysis of agroecosystems.

Prerequisite: (HORT 100 or SOCR 100) and (SOCR 240).

Registration Information: Must register for lecture and laboratory. Required field trips.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: Yes.

SOCR 424 Topics in Organic Agriculture Credits: 3 (3-0-0)

Also Offered As: HORT 424.

Course Description: Examination of issues specific to organic food production systems and marketing.

Prerequisite: (AREC 202 or ECON 202) and (AREC 328 and SOCR 240) and (HORT 100 or SOCR 100) and (SOCR 171 or HORT 171).

Registration Information: Credit not allowed for both SOCR 424 and HORT 424.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 425 Internet of Ag Things--Sensors and Data Lab Credits: 2 (0-4-0)

Course Description: Explore how data is collected from internet-connected sensors (internet of Ag Things, IoAT) and other platforms used to improve management decisions across a wide range of agricultural use cases. Emphasis on sensor technology used to make measurements and the data science required to transform information into actionable management decisions.

Prerequisite: STAT 201.

Registration Information: Required field trips.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 440 Pedology Credits: 4 (2-3-1)

Course Description: Process of soil formation, characterization, classification of soils; soil survey methods.

Prerequisite: None.

Registration Information: Must register for lecture, laboratory and recitation.

Term Offered: Fall.

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: Yes.

SOCR 441 Soil Ecology Credits: 3 (2-3-0)

Course Description: An integrative, hands-on experience in the theory and application of ecology principles to the soil environment.

Prerequisite: SOCR 240.

Term Offered: Spring (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 442 Forest and Range Soils Credits: 3 (3-0-0)

Course Description: Soil and water relationships in forest and rangeland ecosystems; significant properties in their management.

Prerequisite: None.

Term Offered: Spring.

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 443 Soil Survey Field Practicum Credit: 1 (0-0-2)

Course Description: Designed to offer the opportunity to conduct soil survey field work with professional soil scientists in pristine natural areas across the state of Colorado. Experience place-based learning, and training to take a project from its initial stages of planning to completion; this includes site determination, data collection, and post-field lab and data analysis. Deliverables include a) soil properties database and b) presentation summarizing finding.

Prerequisite: SOCR 440, may be taken concurrently.

Registration Information: This is a partial semester course. Required field trips. Credit not allowed for both SOCR 443 and SOCR 481A4.

Term Offered: Fall.

Grade Mode: S/U Sat/Unsat Only.

Special Course Fee: No.

SOCR 455 Microbiomes of Soil Systems Credits: 3 (3-0-0)

Course Description: Microbial activities in agricultural, wetland, and grassland soils; in soil-plant relationships; and in maintenance of environmental quality.

Prerequisite: MIP 300 or SOCR 240.

Term Offered: Fall.

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 456 Soil Microbiology Laboratory Credit: 1 (0-3-0)

Course Description: Techniques used in study of ecology and activities of soil microorganisms.

Prerequisite: SOCR 455, may be taken concurrently.

Term Offered: Fall.

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 460 Plant Breeding and Biotechnology Credits: 3 (2-0-1)

Also Offered As: HORT 460.

Course Description: Theory and practice of plant breeding and biotechnology using principles of genetics and related sciences.

Prerequisite: BZ 350 or LIFE 201A or SOCR 330.

Registration Information: Must register for lecture and recitation. Required field trips. Credit not allowed for both HORT 460 and SOCR 460.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 467 Soil and Environmental Chemistry Credits: 3 (3-0-0)

Course Description: Fundamental principles of soil chemistry with respect to environmental reactions between soils and other natural materials and priority pollutants.

Prerequisite: CHEM 335.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 470 Soil Physics Credits: 3 (3-0-0)

Course Description: Physical properties of soils emphasizing mechanical composition, moisture, aeration, temperature, and structure related to management, plant growth.

Prerequisite: SOCR 240 or GEOL 232.

Term Offered: Fall.

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 471 Soil Physics Laboratory Credit: 1 (0-3-0)

Course Description: Familiarization of techniques and equipment used in evaluation of soil physical properties.

Prerequisite: SOCR 470, may be taken concurrently.

Term Offered: Fall.

Grade Mode: S/U Sat/Unsat Only.

Special Course Fee: No.

SOCR 475 Global Challenges in Plant and Soil Science Credits: 3 (3-0-0)

Course Description: Evaluation of case studies to define problems and develop solutions to address global challenges in plant and soil science.

Prerequisite: (SOCR 240 or GEOL 122) and (LIFE 102 or BZ 120).

Term Offered: Spring (even years).

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 486 Practicum Credits: Var[1-4] (0-0-0)

Course Description: Directed experiences in the application of soil and crop science principles.

Prerequisite: None.

Registration Information: Written consent of instructor. May be taken for a maximum of 4 credits.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 487 Internship Credits: Var[1-12] (0-0-0)

Course Description:

Prerequisite: None.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 490 Hydrus-1D Workshop Credit: 1 (0-0-1)

Course Description: Using Hydrus-1D software for flow and transport of water, heat, and chemicals in soil.

Prerequisite: SOCR 470.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 492 Preparing for Impact--Your Career Journey Credit: 1 (0-0-1)

Course Description: Explore different career paths in soil and crop sciences. Emphasis on key skills for professional success.

Prerequisite: None.

Registration Information: Senior standing.

Term Offered: Fall.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 495 Independent Study Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 496 Group Study Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 498 Undergraduate Research Credits: Var[1-6] (0-0-0)

Course Description: Research in soil and crop sciences.

Prerequisite: None.

Registration Information: Written consent of instructor.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 500 Environmental Measurement Laboratory Credit: 1 (0-2-0)

Course Description: A hands-on instrumentation lab for making environmental, weather, and soil measurements using low-cost microcontroller boards and sensors.

Prerequisite: PH 110.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 501 Plant Genetic Resources--Origins Credit: 1 (1-0-0)

Course Description: Focus on the origins of plant genetic resources, including: role in global food systems, domestication and diversification, genetic properties of plant genomes, forces shaping diversity, and geographic patterns of diversity. The first of a three part introduction to plant genetic resources.

Prerequisite: SOCR 330.

Registration Information: This is a partial semester course. Offered as an online course only. Credit not allowed for both SOCR 501 and SOCR 581A4.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 502 Plant Genetic Resources--Conservation Credit: 1 (1-0-0)

Course Description: Focus on the conservation of plant genetic resources, including: ethics and governance of germplasm exchange, collection and regeneration of germplasm in genebanks, and management and distribution of germplasm. The second part of a three part introduction to plant genetic resources.

Prerequisite: SOCR 330.

Registration Information: This is a partial semester course. Offered as an online course only. Credit not allowed for both SOCR 502 and SOCR 581A5.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 503 Plant Genetic Resources--Discovery Credit: 1 (1-0-0)

Course Description: Focus on the utilization of plant genetic resources, including: understanding stakeholders, characterization of phenotypes and genotypes, discovery and mapping of useful traits and alleles, and transfer alleles from genebanks to breeding programs via pre-breeding. The third part of a three part introduction to plant genetic resources.

Prerequisite: SOCR 330.

Registration Information: This is a partial semester course. Offered as an online course only. Credit not allowed for both SOCR 503 and SOCR 581A6.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 522 Micrometeorology Credits: 3 (3-0-0)

Course Description: Microenvironments; physics of environmental variables; plant canopy microclimate; evapotranspiration; surface-atmosphere exchange; instrumentation.

Prerequisite: PH 100 to 499 - at least 3 credits.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 523A Environmental Data Science Applications:

Introduction Credits: 3 (3-0-0)

Also Offered As: ESS 523A.

Course Description: Explore tools and best practices for working with large environmental datasets primarily using the programming language R. Cover technical topics like: data types, file management, iteration, functional programming, debugging, code management and collaboration with git and GitHub. Use these tools to analyze environmental data using statistical approaches like: linear models, trend analysis, simple machine learning techniques.

Prerequisite: STAR 511 or STAT 158.

Registration Information: This is a partial semester course. Credit not allowed for both ESS 523A and SOCR 523A.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 523B Environmental Data Science Applications: Food and Agriculture Credits: 2 (2-0-0)

Also Offered As: ESS 523B.

Course Description: Explore the application of data science to the analysis of food and agricultural systems. Examine the ways food and agricultural researchers utilize data science in contemporary scientific literature and in research taking place across campus. Work in a team to create, document, and communicate an analysis that utilizes data science techniques to answer questions about food and agricultural system functioning and/or sustainability.

Prerequisite: ESS 523A, may be taken concurrently or SOCR 523A, may be taken concurrently.

Registration Information: This is a partial semester course. Credit not allowed for both ESS 523B and SOCR 523B.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 530 Scientific Writing Credit: 1 (1-0-0)

Also Offered As: BSPM 530.

Course Description: Skills necessary to prepare complete scientific journal articles including writing, editing, and literature searching and assessment.

Prerequisite: None.

Registration Information: Credit not allowed for both BSPM 530 and SOCR 530.

Term Offered: Spring.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 535 Origin and Evolution of Cultivated Plants Credits: 3 (3-0-0)

Course Description: Origin of crops from viewpoints of archaeology, history, botany, and taxonomy, and continued evolution of plants under cultivation.

Prerequisite: SOCR 330.

Term Offered: Fall (even years).

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 540 Soil-Plant-Nutrient Relationships Credits: 3 (3-0-0)

Course Description: Soil and plant factors affecting nutrient uptake, mechanistic models of uptake, availability and functions of essential elements, diagnostic techniques.

Prerequisite: SOCR 350.

Term Offered: Spring (even years).

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 545 Current Methods in Microbial Genomics Credits: 2 (2-0-0)

Course Description: The characterization of metagenomes and additional "omes" (e.g. metatranscriptome, metaproteome, and metabolome) provides synergistic information to further our functional understanding of individual members of the microbial communities, as well as their interactions. Introduction to current multi-omics methods as applied to environmental and host-associated microbiology.

Prerequisite: None.

Restriction: Must be a: Graduate.

Registration Information: Graduate standing.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 550 Advanced Soil Genesis Credits: 3 (3-0-0)

Course Description: Modern concepts of specific mechanisms involved in formation of genetic soil groups and their relationship to environmental factors.

Prerequisite: SOCR 440.

Term Offered: Spring (even years).

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 567 Environmental Soil Chemistry Credits: 4 (3-0-1)

Course Description: The chemistry of terrestrial environments and the interactions of soil constituents with bacteria, nutrients, and pollutants.

Prerequisite: CHEM 335.

Registration Information: Credit not allowed for SOCR 467 and SOCR 567.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 570 Plant Breeding for Drought Tolerance Credit: 1 (1-0-0)

Course Description: Principles and practices of evaluation, selection and cultivar development for crops in drought-stress environments with an emphasis on agronomic crops.

Prerequisite: SOCR 330 and SOCR 460.

Registration Information: Offered as an online course only.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 571 Foundations of Soil Science Credits: 2 (2-0-0)

Course Description: Importance of soils in ecology and earth system science with regard to the study and management of the soil resource.

Prerequisite: SOCR 240.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 572 Internet-of-Things Environmental Sensors Lab Credit: 1 (0-2-0)

Course Description: Hands on training with environmental sensors and electronics that have internet-of-things (IoT) connectivity.

Prerequisite: None.

Registration Information: Credit not allowed for both SOCR 572 and SOCR 581A3.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 577 Principles/Components: Precision Agriculture Credits: 3 (2-2-0)

Course Description: Principles and components of precision agriculture, including GPS, GIS, remote sensing, and their applications in soil and crop management.

Prerequisite: SOCR 100 to 499 - at least 3 credits or CS 100 to 499 - at least 3 credits.

Registration Information: Must register for lecture and laboratory. Credit not allowed for both SOCR 577 and SOCR 377. Required field trips.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 620 Modeling Ecosystem Biogeochemistry Credits: 3 (2-3-0)

Course Description: Design and build biogeochemical process and ecosystem models with GUI-based software. Analyze and test models and interpret experimental data.

Prerequisite: (ECOL 505 or LAND 220 or LIFE 220 or SOCR 240) and (MATH 155 or MATH 160).

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 640 Crop Physiology Credit: 1 (1-0-0)

Course Description: Developmental, physiological, and biochemical determinants of crop yields as controlled by genetic and environmental effects.

Prerequisite: BZ 440.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 650 Research Proposal Development Credit: 1 (1-0-0)

Course Description: Skills to develop and write an effective scientific research proposal.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Graduate standing.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 670 Terrestrial Ecosystems Isotope Ecology Credits: 3 (2-2-0)

Course Description: Isotope distribution in biogeochemical cycles, research topics in biosphere-atmosphere interactions; lab experience with isotope techniques.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must register for lecture and laboratory. Required field trips.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 675 Presentations for Scientific Audiences Credit: 1 (1-0-0)

Course Description: Organization and presentation of scientific information to audiences in oral and poster format.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 699 Thesis Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 720 Advanced Plant Breeding Credits: 4 (4-0-0)

Course Description: Systems of mating and selection in plants to maximize genetic gain. Evaluation of heterosis, germplasm diversity, strategies, and new technologies.

Prerequisite: (SOCR 460 or HORT 460) and (STAT 100 to 499 - at least 3 credits).

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 720A Advanced Plant Breeding: Methods Credits: 2 (2-0-0)

Course Description: Historical perspectives in plant breeding, plant reproduction, genetic gain, breeding and selection systems in self- and cross-pollinated plants.

Prerequisite: (SOCR 460 or HORT 460) and (STAT 100 to 799 - at least 3 credits).

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 720B Advanced Plant Breeding: Tools Credits: 2 (2-0-0)

Course Description: Plant breeding strategies, genotype x environment interaction, field plot and genomic tools, breeding for pest resistance, stress tolerance, quality.

Prerequisite: (SOCR 460 or HORT 460) and (STAT 100 to 799 - at least 3 credits).

Restriction: Must not be a: Graduate, Professional.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 725 Quantitative Inheritance in Plant Breeding Credits: 3 (2-2-0)

Course Description: Quantitative genetic structure of populations, recognition of genetic, environmental variance. Methods of dealing with quantitatively inherited traits.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must register for lecture and laboratory.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 730 Topics in Plant Breeding and Genetics Credit: 1 (1-0-0)

Course Description: Current literature regarding mechanisms used for plant improvement.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 731 Plant Breeding Data Management Credit: 1 (1-0-0)

Course Description: Principles and best practices for optimal data management for plant breeding and other data-intensive research programs.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must have taken three credits in computer science.

Term Offered: Fall (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 740 Plant Molecular Genetics Credits: 3 (3-0-0)

Also Offered As: BSPM 740.

Course Description: Advances in study of organization and function of nuclear and organellar genomes, gene expression in higher plants, and plant-microbe interactions.

Prerequisite: BC 351 and SOCR 330.

Restriction: Must be a: Graduate, Professional.

Registration Information: Credit not allowed for both SOCR 740 and BSPM 740.

Term Offered: Fall (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 755 Advanced Soil Microbiology Credits: 3 (3-0-0)

Course Description: Ecology of soil microorganisms emphasizing population and activity relationships, nitrogen fixation, and microbe-pesticide interactions.

Prerequisite: MIP 624 or SOCR 455.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (even years).

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 760 Advanced Soil Chemistry Credits: 3 (3-0-0)

Course Description: Surface chemistry of soils, electrical double layer models of surface charge and potential, colloid stability, computer modeling of adsorption.

Prerequisite: (CHEM 100 to 481 - at least 4 courses and CS 100 to 481 - at least 1 course) and (MATH 141 or MATH 155 or MATH 160).

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (odd years).

Grade Modes: S/U within Student Option, Trad within Student Option.

Special Course Fee: No.

SOCR 770 Advanced Soil Physics Credits: 4 (3-2-0)

Course Description: Description and analysis of principles of storage and movement of water, solutes, heat, and gases in soils.

Prerequisite: MATH 261 or SOCR 470.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must register for lecture and laboratory.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

SOCR 784 Supervised College Teaching Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 792 Seminar Credit: 1 (0-0-1)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 795 Independent Study Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 796 Group Study Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

SOCR 799 Dissertation Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.