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/)
  - Applied Information Technology Concentration (http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-major-applied-information-technology-concentration/)

- International Soil and Crop Sciences Concentration (http://catalog.colostate.edu/general-catalog/colleges/agricultural-sciences/soil-crop-sciences/soil-crop-sciences-international-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/)

Minors
- 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/)

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: No.

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.

SOCR 177 Applied Information Technology in Agriculture Credit: 1 (0-0-1)
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 Introductory Seminar 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 Crop Production Systems 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: 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.
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 Forage and Pasture Management  Credits: 3 (3-0-0)**

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

**Prerequisite:** None.

**Term Offered:** Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**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:** Yes.

**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.

**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  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).

**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: No.

SOCR 370 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-atmospheric system.
Prerequisite: (HORT 100 or SOCR 100 or BZ 120) and (SOCR 240).
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

SOCR 371 Irrigation of Field Crops Credit: 1 (1-0-0)
Course Description: Management of irrigation systems for field crops with emphasis on 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: 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--Science and Impacts 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: 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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
<th>Registration Information</th>
<th>Grade Mode</th>
<th>Special Course Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCR 413</td>
<td>Seed Vigor Concepts and Testing</td>
<td>2</td>
<td>(HORT 100 or SOCR 100) and (SOCR 240)</td>
<td>Must register for lecture and laboratory. Required field trips. Credit not allowed for both</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 415</td>
<td>Pollinator Management in Agroecosystems</td>
<td>2</td>
<td>(AREC 202 or ECON 202) and (AREC 328 and SOCR 240) and (HORT 100 or SOCR 100) and (SOCR 240)</td>
<td>Required field trips. Credit allowed for only one of the following: BZ 416, BZ 416, SOCR 415, or SOCR 416.</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 416</td>
<td>Pollination Biology and Management</td>
<td>3</td>
<td>None. Prerequisite: SOCR 240, may be taken concurrently.</td>
<td>May be taken concurrently. Required field trips. Credit not allowed for both SOCR 415 and BSPM 415.</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 421</td>
<td>Agroecosystem Management</td>
<td>4</td>
<td>(HORT 100 or SOCR 100) and (SOCR 240)</td>
<td>Must register for lecture and laboratory. Required field trips. Credit not allowed for both</td>
<td>Traditional</td>
<td>Yes</td>
</tr>
<tr>
<td>SOCR 424</td>
<td>Topics in Organic Agriculture</td>
<td>3</td>
<td>(AREC 202 or ECON 202) and (AREC 328 and SOCR 240) and (HORT 100 or SOCR 100) and (SOCR 171 or HORT 171).</td>
<td>Must register for lecture and laboratory. Required field trips. Credit not allowed for both</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 425</td>
<td>Internet of Ag Things--Sensors and Data Lab</td>
<td>2</td>
<td>None. Prerequisite: STAT 201, may be taken concurrently.</td>
<td>Offered as an online course only. Credit not allowed for both SOCR 413 and SOCR 481A1.</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 440</td>
<td>Pedology</td>
<td>4</td>
<td>None. Prerequisite: None.</td>
<td>Offered as an online course only. Credit not allowed for both SOCR 440 and SOCR 481A4.</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 441</td>
<td>Soil Ecology</td>
<td>3</td>
<td>None. Prerequisite: None.</td>
<td>Offered as an online course only. Credit not allowed for both SOCR 441 and SOCR 481A4.</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 442</td>
<td>Forest and Range Soils</td>
<td>3</td>
<td>None. Prerequisite: None.</td>
<td>Offered as an online course only. Credit not allowed for both SOCR 442 and SOCR 481A4.</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 443</td>
<td>Soil Survey Field Practicum</td>
<td>1</td>
<td>None. Prerequisite: None.</td>
<td>Offered as an online course only. Credit not allowed for both SOCR 443 and SOCR 481A4.</td>
<td>Traditional</td>
<td>No</td>
</tr>
<tr>
<td>SOCR 455</td>
<td>Soil Microbiology</td>
<td>3</td>
<td>None. Prerequisite: None.</td>
<td>Offered as an online course only. Credit not allowed for both SOCR 455 and SOCR 481A4.</td>
<td>Traditional</td>
<td>No</td>
</tr>
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**Course Description:**

- **SOCR 413 Seed Vigor Concepts and Testing:** Provide a basic understanding of the concept of seed vigor, methods for seed vigor testing, and the relationship of crop performance.
- **SOCR 415 Pollinator Management in Agroecosystems:** 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.
- **SOCR 416 Pollination Biology and Management:** Basic pollination processes and pollination ecology, its relation to fruit formation, crop production and yield. Learn about pollination biology of cultivated crops and plants in natural areas. The knowledge gained is critical in formulating practices for understanding plant-pollinator mutualism and coevolution, pollination management, restoring habitats and for pollinator conservation.
- **SOCR 421 Agroecosystem Management:** 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.
- **SOCR 424 Topics in Organic Agriculture:** Examination of issues specific to organic food production systems and marketing.
- **SOCR 425 Internet of Ag Things--Sensors and Data Lab:** 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.

**Registration Information:**

- Must register for lecture and laboratory. Required field trips. Credit not allowed for both SOCR 413 and SOCR 481A1.
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**Grade Mode:**

- Traditional
- Traditional
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- Traditional
- Traditional
- Traditional
- Traditional
- Traditional

**Special Course Fee:**

- No
- No
- No
- Yes
- No
- No
- No
- No

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**Registration Information:**

- Must register for lecture and laboratory. Required field trips. Credit not allowed for both SOCR 413 and SOCR 481A1.
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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 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 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.

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**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 organelar 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.

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**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.

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**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.

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**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.

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**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.

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**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.

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**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.