

SOIL SCIENCE (SOIL SCI)

SOIL SCI 1 – COOPERATIVE EDUCATION/CO-OP IN SOIL SCIENCE

1 credit.

Full-time off-campus work experience which combines classroom theory with practical knowledge of operations to provide students with a background upon which to base a professional career. Students receive credit only for the term in which they are actively enrolled and working. The same work experience may not count towards credit in Soil Science 399.

Requisites: Consent of instructor

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2015

SOIL SCI/ENVIR ST 101 – FORUM ON THE ENVIRONMENT

1-2 credits.

Lectures and discussions about environmental issues. Historical and contemporary environmental impacts of humans on the biosphere. Global futures: population, technology, societal values, resources and prospects for sustainable management.

Requisites: None

Course Designation: Breadth – Either Social Science or Natural Science
Level – Elementary

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

SOIL SCI 131 – EARTH'S SOIL: NATURAL SCIENCE AND HUMAN USE

1 credit.

A overview of the soils of the world and the grand environmental challenges that face humanity. Soils of the USA and Wisconsin included.

Requisites: None

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Elementary

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Spring 2024

SOIL SCI/ATM OCN 132 – EARTH'S WATER: NATURAL SCIENCE AND HUMAN USE

3 credits.

Water is central to the functioning of planet Earth. As humans increase their impact on Earth's systems and cohabitants, our understanding of the multiple roles of water becomes critical to finding sustainable strategies for human and ecosystem health. Explores the science of Earth's hydrosphere, with constant attention to human uses and impacts.

Requisites: None

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Elementary

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Identify and summarize the connections amongst stocks and flows in the hydrosphere. Audience: Undergraduate

2. Analyze chemical, physical and biological indicators of water quality and their influence in human health. Audience: Undergraduate

3. Identify human impacts on water quality and quantity in local, regional and global perspectives, and in a changing global climate. Audience: Undergraduate

4. Illustrate and summarize the dependence of the global food supply on water. Audience: Undergraduate

5. Analyze the causes of and solutions for the sustainability challenge of clean water and sanitation, contrasting issues in developed and developing countries. Audience: Undergraduate

6. Apply sustainability principles to addressing the challenge of competing water uses in the US, particularly among water use for Food Production, Hygiene and Sanitation, Recreation and Environmental Flows. Audience: Undergraduate

SOIL SCI 211 – SOILS AND CLIMATE CHANGE

2 credits.

Soil represents the largest terrestrial pool of carbon, and our management of soil will play a key role in the future of our planet. Course topics include overviews of basic soil science and climate change science; how climate affects soil formation, soil carbon and soil organic matter; soil carbon dynamics in urban areas, the tropics, and the arctic; how humans influence soil carbon stocks around the globe.

Requisites: None**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Elementary

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No**Learning Outcomes:** 1. Explain the role of climate as a soil forming factor.

Audience: Undergraduate

2. Describe the components of the terrestrial carbon cycle and how land management decisions and other human actions affect each component.

Audience: Undergraduate

3. Explain the social, economic, and environmental dimensions of the sustainability challenge of enhancing soil carbon sequestration to mitigate climate change.

Audience: Undergraduate

4. Describe the social, economic, and environmental dimensions of conversion from traditional agriculture to regenerative agriculture and identify potential tradeoffs and interrelationships among these dimensions at a level appropriate to the course.

Audience: Undergraduate

5. Predict how warming in the arctic may affect the release of greenhouse gasses, including CO₂, N₂O, and CH₄ using reasonable assumptions and basic calculations.

Audience: Undergraduate

SOIL SCI/ENVIR ST/GEOG 230 – SOIL: ECOSYSTEM AND RESOURCE

3 credits.

Soils are fundamental to ecosystem science. A systems approach is used to investigate how soils look and function. Topics investigated include soil structure, biology, water, fertility, and taxonomy as well as the human impact on the soil environment.

Requisites: Not open to students with credit for SOIL SCI 301**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No**Last Taught:** Spring 2024**SOIL SCI 250 – INTRODUCTION TO ENVIRONMENTAL SCIENCE**

3 credits.

Discuss how Planet Earth is an interconnected system dominated by the ever-present exchange of materials and energy that control the fitness and fate of all living organisms. Designed to introduce the interdisciplinary field of Environmental Science by providing a broad overview of the basic concepts used to make sense of the environment. Explore how natural systems work, the services they provide, important environmental challenges facing these systems, and how people are working to address them. Includes professionals in the field as guest speakers to discuss a future in Environmental Sciences.

Requisites: None**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Elementary

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No**Last Taught:** Fall 2023**Learning Outcomes:** 1. define and apply terminology commonly used in environmental science Audience: Undergraduate

2. apply the scientific process to environmental issues and articulate its pros and cons Audience: Undergraduate

3. demonstrate an understanding of the flow and accumulation of energy and materials within a systems context Audience: Undergraduate

4. identify abiotic and biotic components of the environment and describe their interactions Audience: Undergraduate

5. examine environmental challenges and approaches to their remediation Audience: Undergraduate

6. compare and contrast careers in environmental science Audience: Undergraduate

7. apply systems thinking to understand environmental challenges Audience: Undergraduate

SOIL SCI 289 – HONORS INDEPENDENT STUDY

1-2 credits.

Research work under direct guidance of a Soil Science faculty or instructional academic staff member. Students are responsible for arranging the work and credits with the supervising instructor. Intended for students in the CALS Honors Program.

Requisites: Consent of instructor**Course Designation:** Honors - Honors Only Courses (H)**Repeatable for Credit:** Yes, unlimited number of completions

SOIL SCI 299 – INDEPENDENT STUDY

1-3 credits.

Research work under direct guidance of a faculty or instructional academic staff member. Students are responsible for arranging the work and credits with the supervising instructor.

Requisites: Consent of instructor

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

SOIL SCI 301 – GENERAL SOIL SCIENCE

3 credits.

Physical chemical and biological properties of soils as they affect soil-plant-water relations, soil classification and suitability for agricultural and other uses.

Requisites: (CHEM 103, 109, or 115) and (MATH 112, 114, 171 or placement into MATH 221), or graduate/professional standing

Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Define and describe the basic chemical, physical and biological principles of soils. Audience: Both Grad Undergrad

2. Use the acquired knowledge of soil properties to make land use decisions. Audience: Both Grad Undergrad

3. Perform quantitative calculations about nutrient status of soil, water content and flow rate, and carbon and greenhouse gas fluxes of soils. Audience: Both Grad Undergrad

4. Classify soils based on their properties. Audience: Both Grad Undergrad

5. Relate the principles of soil science to the Soil Science Society of America's Four Grand Challenges: Human and Ecosystem Health, Waste Treatment and Water Quality, Food Energy and Security, and Climate Change. Audience: Both Grad Undergrad

6. Create a work of art (poem, song, story, etc.) that demonstrates their mastery of soil science. Audience: Both Grad Undergrad

7. Apply principles of soil science to make predictions about a contemporary issue in soil science. Audience: Graduate

SOIL SCI 302 – MEET YOUR SOIL: SOIL ANALYSIS AND INTERPRETATION LABORATORY

1 credit.

Hands-on laboratory on soil analysis and interpretation of soil properties for different uses, such as food production, waste management, water quality, stormwater control, and environmental sustainability.

Requisites: (GEOG/ENVIR ST/SOIL SCI 230 or SOIL SCI 301, or concurrent enrollment) or graduate/professional standing

Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Complete laboratory procedures of a variety of physical and chemical properties of soil, using the detailed methodology provided by instructor. Audience: Both Grad Undergrad

2. Demonstrate proficiency in technical writing and data presentation in scientific format. Audience: Both Grad Undergrad

3. Analyze and contrast the soil dataset for assignation of appropriate soil uses at different scales. Audience: Both Grad Undergrad

4. Integrate analytical results with soil science principles. Audience: Both Grad Undergrad

5. Discuss and communicate appropriate sustainable agronomical and environmental services for the studied soil. Audience: Graduate

SOIL SCI 321 – SOILS AND ENVIRONMENTAL CHEMISTRY

3 credits.

Sources, reactions, transport, effects, and fates of chemical species in soils and associated water and air environments. Emphasis on the chemical behavior of elements and compounds and the phenomena affecting natural and anthropogenic materials in soils.

Requisites: CHEM 104, 109, 116, or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI/PL PATH 323 – SOIL BIOLOGY

3 credits.

Nature, activities and role of organisms inhabiting soil. Effects of soil biota on ecosystem function, response to cultural practices, and impacts on environmental quality, including bioremediation of contaminated soils.

Requisites: (ZOOLOGY/BIOLOGY/BOTANY 152, or ZOOLOGY/BIOLOGY 101 and 102, or BOTANY/BIOLOGY 130, or BIOCORE 384) and (CHEM 104, 109, or 116), or graduate/professional standing

Course Designation: Breadth – Biological Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI/ENVIR ST 324 – SOILS AND ENVIRONMENTAL QUALITY

3 credits.

Interaction of soils with environmental contaminants and the role of soils in pollution control.

Requisites: CHEM 104, 109, 116, or graduate/professional standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI/AGRONOMY/HORT 326 – PLANT NUTRITION MANAGEMENT

3 credits.

Functions, requirements and uptake of essential plant nutrients; chemical and microbial processes affecting nutrient availability; diagnosis of plant and soil nutrient status; fertilizers and efficient fertilizer use in different tillage systems.

Requisites: (CHEM 103, 109, or 115 and SOIL SCI/ENVIR ST/GEOG 230) or SOIL SCI 301, or graduate/professional standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2024

SOIL SCI 327 – ENVIRONMENTAL MONITORING AND SOIL CHARACTERIZATION FOR EARTH'S CRITICAL ZONE

4 credits.

Characterization of a soil in the field. Monitoring water flow, heat exchange, solute transport and greenhouse gas emission using soil physical models and state-of-the-art soil sensing technologies.

Requisites: SOIL SCI/ENVIR ST/GEOG 230, SOIL SCI 301, or graduate/professional standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Explain soil variations within the profile and across the landscape within the Critical Zone Audience: Both Grad Undergrad

10. Apply models to estimate fluxes of water, heat, gas, and solute transport in soils using soil sensor measurements and soil physical models Audience: Graduate

2. Explain the processes that control differences and similarities in soils Audience: Both Grad Undergrad

3. Summarize how soils are described, mapped, and classified Audience: Both Grad Undergrad

4. Explain the concepts of the soil physical properties used to describe the characteristics of soil solid, liquid, and gas phases. Audience: Both Grad Undergrad

5. Explain the social, economic, and/or environmental dimensions of the sustainability challenges of the Critical Zone Audience: Both Grad Undergrad

6. Obtain field experiences on soil description and collection of soil sensor measurements to monitor water, heat, gas, and solute transport in soils Audience: Both Grad Undergrad

7. Analyze the causes of and solutions for the sustainability challenge of the Critical Zone Audience: Both Grad Undergrad

8. Prepare and present an oral presentation Audience: Both Grad Undergrad

9. Critically evaluate the scientific articles in soil and environmental issues. Audience: Graduate

SOIL SCI 330 – HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE (HAZWOPER) AND FIELD SAFETY TRAINING

1 credit.

Conforms to the guidelines covered under the Occupational Safety and Health Administration (OSHA) standard 29 CFR part 1910.120 for providing Hazardous Wasted Operations and Emergency Response (HAZWOPER) 40-hour certification, required for workers involved in clean-up operations, voluntary clean-up operations, emergency response operations, and the storage, disposal, or treatment of hazardous substances or uncontrolled hazardous waste sites. Beyond satisfying OSHA standards, provides safety training for personnel conducting field sampling operations in proximity of heavy equipment (e.g. excavators, drilling rigs, dump trucks) through guest lectures and videos. Additionally, case studies relating to field safety operations will be examined.

Requisites: None

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Identify site hazards (ionizing radiation, oxidizer, biological, safety, and electrical) and exposure routes of hazardous materials into the human body. Audience: Undergraduate

2. Identify the dangers associated with oxygen deficiency, heat stress, cold and noise exposure, and confined space entry. Audience: Undergraduate

3. Explain the types, uses, and limitations of personal protective equipment including self-contained breathing apparatus, supplied air and air-purifying respirators, and chemical protective clothing. Audience: Undergraduate

4. Demonstrate the donning and operation of different levels of personal protective equipment. Audience: Undergraduate

5. Interpret a Health and Safety Plan, and air monitoring device data. Audience: Undergraduate

6. Explain the roles and responsibilities of field sampling personnel and equipment operators Audience: Undergraduate

SOIL SCI/HORT 332 – TURFGRASS NUTRIENT AND WATER MANAGEMENT

3 credits.

Nutrient requirements of turfgrasses; nature of turfgrass response to fertilization; soil and tissue testing methodology and interpretation; irrigation scheduling; irrigation water quality; use of irrigation and fertilizer to minimize environmental impact; writing effective nutrient management plans.

Requisites: SOIL SCI/AGRONOMY/HORT 326 or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2018

SOIL SCI/AGRONOMY/ENTOM/HORT/PL PATH 354 – DIAGNOSING AND MONITORING PEST AND NUTRIENT STATUS OF FIELD CROPS

1 credit.

Provides students with information necessary to diagnosis and monitor corn, soybean, alfalfa and wheat for pests (insects, weeds, diseases) and nutrient deficiency symptoms including perspectives from Agronomy, Entomology, Horticulture, Plant Pathology and Soil Science. Proper soil and pest sampling information will be provided as will proper cropstaging techniques which are essential for pest and nutrient management.

Requisites: None

Repeatable for Credit: No

Last Taught: Spring 2019

SOIL SCI/AGRONOMY/BOTANY 370 – GRASSLAND ECOLOGY

3 credits.

Understand factors driving global, continental, regional, and local distribution of grasslands. Discuss how management affects provision of grassland ecosystem goods and services. Compare and contrast plant community and ecosystem dynamics in native prairie and intensively managed pastures.

Requisites: PL PATH/BOTANY 123, BOTANY/BIOLOGY 130, SOIL SCI/ ENVIR ST 101, SOIL SCI/ATM OCN 132, ZOOLOGY/BIOLOGY/ BOTANY 151, BIOCORE 381, BOTANY 100, or AGRONOMY 100, or graduate/professional standing

Course Designation: Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI/BSE/CIV ENGR 372 – ON-SITE WASTE WATER TREATMENT AND DISPERSAL

2 credits.

On-site treatment and dispersal of waste water from homes, commercial sources and small communities. Sources, pretreatment units, nutrient removal units, constructed wetlands, surface and soil dispersal systems, recycle and reuse systems, regulations, alternative collection systems.

Requisites: CHEM 103, 109, or 115

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI 375 – SPECIAL TOPICS

1-3 credits.

Special topics on contemporary issues relevant to soil science.

Requisites: None

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2020

Learning Outcomes: 1. Demonstrate an ability to understand soils within the context of either its biological, physical, or chemical properties
Audience: Undergraduate

2. Communicate soil properties and function either in written or oral form
Audience: Undergraduate

3. Explain soil characteristics and function within a larger context whether it be societal, economic, international, or local
Audience: Undergraduate

4. Link soil function to soil characteristics that demonstrate understanding of their importance
Audience: Undergraduate

SOIL SCI 399 – COORDINATIVE INTERNSHIP/COOPERATIVE EDUCATION

1-8 credits.

An internship under guidance of a Soil Science faculty or instructional academic staff member and internship site supervisor. Students are responsible for arranging the work and credits with the Soil Science faculty or instructional academic staff member and the internship site supervisor.

Requisites: Consent of instructor

Course Designation: Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Workplace - Workplace Experience Course

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2019

SOIL SCI 400 – STUDY ABROAD IN SOIL SCIENCE

1-6 credits.

Provides an area equivalency for courses taken on Madison Study Abroad Programs that do not equate to existing UW courses. Current enrollment in a UW-Madison study abroad program

Requisites: None

Repeatable for Credit: Yes, unlimited number of completions

SOIL SCI/MICROBIO 425 – ENVIRONMENTAL MICROBIOLOGY

3 credits.

Microbial interactions in soils, water, extreme environments and biofilms. Modern methods for studying microbial ecology. role of microbes in nutrient cycles and biogeochemistry. Use of microbes for mitigating manmade environmental problems of industrial, agricultural, and domestic origin.

Requisites: MICROBIO 303 and (CHEM 341 or 343), or graduate/professional standing

Course Designation: Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Spring 2024

SOIL SCI 430 – ENVIRONMENTAL SOIL CONTAMINATION

3 credits.

Environmental pollution on global, regional, and local scales is one of humanity's most pressing issues, and will remain so for the foreseeable future. Examine the sources and properties of anthropogenic soil pollution including emerging contaminants such as PFAS, nanomaterials, microplastics. Apply the principles of soil science to understand the transport, mobilization, and partitioning of contaminants in soil and, in turn, how these contaminants affect ecosystem and human health. Through industry guest lecturers and case studies discuss methods to solve issues of soil contamination.

Requisites: (CHEM 103 and 104) or CHEM 109 or (CHEM 115 and 116) or graduate/professional student standing

Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Identify the nature and sources of common and emerging environmental soil pollutants. Audience: Both Grad Undergrad

2. Determine the mobility and bioavailability of common and emerging environmental pollutants in the soil system. Audience: Both Grad Undergrad

3. Analyze case studies to understand environmental and societal impacts and applicable soil remediation techniques. Audience: Both Grad Undergrad

4. Critically evaluate the interpretation of scientific results in published literature. Audience: Graduate

SOIL SCI/F&W ECOL 451 – ENVIRONMENTAL BIOGEOCHEMISTRY
3 credits.

Explores long and short-term cycles of carbon, nitrogen, phosphorus, sulfur, and metals as well as water and energy cycles between water, the atmosphere, terrestrial vegetation, and soils. Emphasizes the linkage between terrestrial vegetation and soils across global biomes for managed and unmanaged ecosystems. Investigates biogeochemical processes through their biochemical constituents, conceptual models and exploration of isotopic and chemical data. Provides a practical understanding of the interactions between components and fluxes of terrestrial ecosystems and how data is developed and employed.

Requisites: CHEM 104, 109, 116, or graduate/professional standing

Course Designation: Breadth – Biological Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Describe global biogeochemical cycles of C, N, P, K, S, Fe, energy, and water and their importance Audience: Both Grad Undergrad

2. Explain the importance of human perturbations to and management of biogeochemical cycles Audience: Both Grad Undergrad

3. Describe key methods used to study biogeochemistry and explain their limitations Audience: Both Grad Undergrad

4. Predict which biogeochemical reactions would be likely across different environments and conditions Audience: Both Grad Undergrad

5. Discuss and critically evaluate scientific papers in biogeochemistry at a graduate level Audience: Graduate

6. Discuss and critically evaluate scientific papers in biogeochemistry at an advanced undergraduate level Audience: Undergraduate

7. Characterize elemental cycling within a system of interest, comparing and contrasting different elements Audience: Graduate

8. Characterize elemental cycling within a system of interest Audience: Undergraduate

SOIL SCI/AN SCI/DY SCI/FOOD SCI 472 – ANIMAL AGRICULTURE AND GLOBAL SUSTAINABLE DEVELOPMENT

1 credit.

Examines issues related to global agriculture and healthy sustainable development. Using a regional approach and focusing on crops and livestock case studies, students will learn the interdependence between US agriculture and agriculture in emerging economies. Some topics covered include population and food, immigration, the environment; crop and livestock agriculture; global trade; sustainability; food security, the role of women in agriculture, and the role of dairy products in a healthy diet.

Requisites: None

Repeatable for Credit: No

Last Taught: Spring 2024

SOIL SCI/AN SCI/DY SCI/FOOD SCI 473 – INTERNATIONAL FIELD STUDY IN ANIMAL AGRICULTURE AND SUSTAINABLE DEVELOPMENT

2 credits.

Examines issues related to global agriculture and healthy sustainable development. Using a regional approach and focusing on crops and livestock case studies, students will learn the interdependence between US agriculture and agriculture in emerging economies. Some topics covered include population and food, immigration, the environment; crop and livestock agriculture; global trade; sustainability; and the role of women in agriculture and the role of dairy products in a healthy diet.

Requisites: DY SCI/AN SCI/FOOD SCI/SOIL SCI 472

Repeatable for Credit: No

SOIL SCI 499 – SOIL MANAGEMENT

3 credits.

A capstone applying independent and team problem solving, critical thinking and oral and written communication skills to issues in soil and environmental sciences.

Requisites: Senior standing only and declared in Soil Science or Environmental Sciences

Course Designation: Level – Advanced

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI/MICROBIO 523 – SOIL MICROBIOLOGY AND BIOCHEMISTRY

3 credits.

Transformations of nutrients and contaminants in soils and groundwater by microorganisms: emphasis on enzymatic mechanisms and metabolic pathways. Approaches for analyzing microbial populations and activities including molecular techniques. Applications of microbial activities for bioremediation of contaminated soils and groundwater. Students should have completed one course in either Soil Science or Microbiology to feel comfortable with the course content.

Requisites: Senior standing, (CHEM 104, 109, or 116) and (ZOOLOGY/BIOLOGY 102, BOTANY/BIOLOGY 130, or ZOOLOGY/BIOLOGY/BOTANY 151), or graduate/professional standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2024

SOIL SCI/F&W ECOL/HORT 524 – URBAN SOIL AND ENVIRONMENT

3 credits.

Many environmental issues related to urbanization are derived from the manipulation of soil. By coupling contemporary literature in urban soils with soil science, students will be able to evaluate environmental issues within the urban environment and provide new ways of remediating their impact.

Requisites: (PHYSICS 103, 201, 207, or 247) and (SOIL SCI/ENVIR ST/ GEOG 230 or SOIL SCI 301 or concurrent), or graduate/professional standing

Course Designation: Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2017

SOIL SCI/GEOG 525 – SOIL GEOMORPHOLOGY

3 credits.

Soil development as related to landscape throughout the Quaternary; focusing on the relationship of soils to climate and vegetation, landscape evolution, and time; principles of soil stratigraphy; case histories of soil geomorphic studies; field trips. Students should have completed one course in geomorphology to feel comfortable with the course content.

Requisites: SOIL SCI 325 or graduate/professional standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Advanced

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2022

SOIL SCI/GEOG 526 – HUMAN TRANSFORMATIONS OF EARTH SURFACE PROCESSES

3 credits.

Takes an earth systems approach to explore the role of human societies in shaping earth surface processes from local to global scales. We address how alterations to our landscapes and waterways affect biological, physical and chemical interactions among our biosphere, geosphere, hydrosphere and atmosphere. We discuss methods used to distinguish the "human impact" from background variability.

Requisites: Junior standing or ENVIR ST/GEOG 120

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Advanced

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2022

SOIL SCI/AGRONOMY/ATM OCN 532 – ENVIRONMENTAL BIOPHYSICS

3 credits.

Plant-environment interactions with particular reference to energy exchanges and water relations. Models are used to provide a quantitative synthesis of information from plant physiology, soil physics, and micrometeorology with some consideration of plant-pest interactions.

Requisites: BIOLOGY/BOTANY 130 and (MATH 211, 217, or 221) and (PHYSICS 103, 201, 207, or 247), or graduate/professional standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2022

SOIL SCI/ENVIR ST 575 – ASSESSMENT OF ENVIRONMENTAL IMPACT

3 credits.

Overview of methods for collecting and analyzing information about environmental impacts on agricultural and natural resources, including monitoring the physical environment and relating impacts to people and society.

Requisites: Junior standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Intermediate

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2024

SOIL SCI 585 – USING R FOR SOIL AND ENVIRONMENTAL SCIENCES

3 credits.

Data science techniques are increasingly important in soil and environmental science, improving the efficiency and repeatability of data analysis and enhancing fundamental understanding of soil and environmental issues. Various R packages will be introduced and used to analyze and process soil and environmental data collected using a variety of in situ, ground-based, and remote sensing platforms. R software will be applied to detailed case studies covering soil and environmental data processing, manipulation, and modeling.

Requisites: (STAT 240, 301, 324, 371, or HORT/F&W ECOL/STAT 571) and (BSE 301, ENVIR ST/CIV ENGR/GEOG 377, LAND ARC/ENVIR ST/F&W ECOL/G L E/GEOG/GEOSCI 371, or 372), or graduate/professional standing

Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Use R software for basic data manipulation, processing, and visualization. Audience: Both Grad Undergrad

10. Analyze sustainability issues and/or practices on soil and environment using a systems-based approach. Audience: Both Grad Undergrad

2. Use R software for basic statistical analysis and hypothesis tests. Audience: Both Grad Undergrad

3. Use R software for spatial and temporal analysis on soil and environmental datasets. Audience: Both Grad Undergrad

4. Become familiar with the use of electromagnetic induction, portable visible near-infrared spectroscopy, and portal X-ray fluorescence spectroscopy for estimating soil and environmental variables in the lab and in the field. Audience: Both Grad Undergrad

5. Build machine learning models using R software for mapping and predicting soil and environmental variables in space and time. Audience: Both Grad Undergrad

6. Access, process, and build models using various open-source soil and environmental datasets from USDA, USGS, NASA, and other sources. Audience: Both Grad Undergrad

7. Become competent in the oral presentation. Audience: Both Grad Undergrad

8. Apply the various R packages to your own research datasets for solving problems in your own disciplines. Audience: Graduate

9. Explain the social, economic, and environmental dimensions of the sustainability challenges of soil and environmental monitoring and management. Audience: Both Grad Undergrad

SOIL SCI 601 – SPECIAL TOPICS IN SOIL SCIENCE

1-3 credits.

Topics in various areas of soil science.

Requisites: Junior standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Summer 2015

SOIL SCI/ENTOM/F&W ECOL/PL PATH 606 – COLLOQUIUM IN ENVIRONMENTAL TOXICOLOGY

1 credit.

Current topics in molecular and environmental toxicology and problems related to biologically active substances in the environment. Topics vary each semester. Lectures are by resident and visiting professors and other researchers.

Requisites: ZOOLOGY/BIOLOGY 101 or BOTANY/BIOLOGY 130 or ZOOLOGY/BIOLOGY/BOTANY 151, or graduate/professional standing

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2016

SOIL SCI 621 – SOIL CHEMISTRY

3 credits.

Solubility relationships, complex ions, ion exchange and oxidation-reduction reactions in soils.

Requisites: CHEM 104, 109, 116, or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI 622 – SOIL PHYSICS

3 credits.

Physical properties of soils. Water retention and transmission in soils.

Transport of heat, gas, and solutes. Physical environment of soil organisms and soil-plant-water relations.

Requisites: (MATH 211, 217, or 221) and (PHYSICS 104, 202, 208, or 248) and SOIL SCI 301, or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2023

SOIL SCI/CIV ENGR 623 – MICROBIOLOGY OF WATERBORNE PATHOGENS AND INDICATOR ORGANISMS

3 credits.

Source, environmental fate and transport of major groups of waterborne pathogens, including epidemiology and testing of associated indicator organism. Management and treatment technologies for prevention of pathogen transmission.

Requisites: CIV ENGR 322 or SOIL SCI/MICROBIO 523 or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2017

SOIL SCI/BOTANY/HORT 626 – MINERAL NUTRITION OF PLANTS

3 credits.

Essential and beneficial elements, solutions and soil as nutrient sources, rhizosphere chemistry, nutritional physiology, ion uptake and translocation, functions of elements, nutrient interactions, genetics of plant nutrition.

Requisites: BOTANY 500 or graduate/professional standing

Course Designation: Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2019

SOIL SCI 630 – FIELD METHODS FOR ENVIRONMENTAL CHARACTERIZATION, ANALYSIS, AND MONITORING

2 credits.

Introduce standard operating procedures and guidance for intrusive and non-intrusive sampling techniques for assessing soil, sediment, surface water, and ground water. Prepare boring logs and install groundwater monitoring well. Properly prepare samples for preservation and shipment. Prepare and maintain defensible field documentation. Use quality control sampling, data verification and validation, and data quality assessment. Decontaminate drilling and field sampling equipment and manage investigative-derived waste.

Requisites: Declared in Environmental Remediation and Management MS

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Summer 2023

Learning Outcomes: 1. Select appropriate non-intrusive or intrusive field sampling methods for environmental site characterization. Audience: Graduate

2. Design and interpret a defensible environmental sampling program using USEPA Data Quality Objectives process. Audience: Graduate

3. Demonstrate the use of field screening instruments. Audience: Graduate

4. Install, develop, and sample a groundwater monitoring well Audience: Graduate

5. Demonstrate appropriate sample preparation, quality control sampling, documentation, and shipment procedures Audience: Graduate

6. Perform data quality assessment and interpret laboratory quality assurance/control reports. Audience: Graduate

SOIL SCI/CIV ENGR/M&ENVTOX 631 – TOXICANTS IN THE ENVIRONMENT: SOURCES, DISTRIBUTION, FATE, & EFFECTS

3 credits.

Nature, sources, distribution, and fate of contaminants in air, water, soil, and food and potential for harmful exposure.

Requisites: (CHEM 104, 109, or 116) and (MATH 211, 217, or 221) and (PHYSICS 104, 202, 208, or 248)

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Spring 2024

SOIL SCI 681 – SENIOR HONORS THESIS

2-4 credits.

Individual study for majors completing theses for Soil Science Honors degrees as arranged with a faculty member. Requires consent of supervising instructor. Enrolled in CALS Honors Program.

Requisites: Consent of instructor**Course Designation:** Honors - Honors Only Courses (H)**Repeatable for Credit:** No**Last Taught:** Spring 2023**SOIL SCI 682 – SENIOR HONORS THESIS**

2-4 credits.

Continuation of 681.

Requisites: Consent of instructor**Course Designation:** Honors - Honors Only Courses (H)**Repeatable for Credit:** No**Last Taught:** Fall 2023**SOIL SCI/ENVIR ST/LAND ARC 695 – APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS IN NATURAL RESOURCES**

3 credits.

Course has four components: 1) Detailed review of GIS concepts; 2) Case studies; 3) GIS implementation methods; 4) Laboratory to provide "hands-on" GIS experience.

Requisites: LAND ARC 211 or ENVIR ST/CIV ENGR/GEOG 377 or graduate/professional standing**Course Designation:** Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No**Last Taught:** Spring 2024**SOIL SCI 699 – SPECIAL PROBLEMS**

1-3 credits.

Individual study for majors completing theses for Soil Science degrees as arranged with a faculty member. Requires consent of supervising instructor.

Requisites: Consent of instructor**Course Designation:** Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: Yes, unlimited number of completions**Last Taught:** Spring 2024**SOIL SCI 728 – GRADUATE SEMINAR**

1 credit.

Topical oral presentations by guest speakers and graduate students on contemporary concerns and issues involving land and soils.

Requisites: Graduate/professional standing**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, unlimited number of completions**Last Taught:** Spring 2024**SOIL SCI 730 – COLLOQUIUM: ENVIRONMENTAL REMEDIATION AND MANAGEMENT**

1 credit.

Topical oral presentations by students, faculty, staff, and guest speakers on contemporary concerns and issues designed to increase knowledge and foster understanding of environmental contamination and remediation of soils and groundwater. Includes instruction and practice in public speaking, presentation visuals, resumes, and networking.

Requisites: Declared in Environmental Remediation and Management MS**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, for 3 number of completions**Last Taught:** Spring 2024**Learning Outcomes:** 1. Research current topics in environmental contamination and remediation \\n \\n Audience: Graduate

2. Develop and deliver an effective and engaging oral presentation Audience: Graduate

3. Utilize effective visual presentation techniques Audience: Graduate

4. Compose a written abstract summarizing presentation \\n Audience: Graduate

SOIL SCI 799 – PRACTICUM IN SOIL SCIENCE TEACHING

1-3 credits.

Instructional orientation to teaching at the higher education level in the agricultural and life sciences, direct teaching experience under faculty supervision, experience in testing and evaluation of students, and the analysis of teaching performance.

Requisites: Graduate/professional standing**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** No**Last Taught:** Spring 2024**SOIL SCI 875 – SPECIAL TOPICS**

1-4 credits.

Special topics on contemporary issues relevant to soil science.

Requisites: Consent of instructor**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, unlimited number of completions**Last Taught:** Spring 2024**SOIL SCI 990 – RESEARCH**

1-12 credits.

Independent research and writing to complete dissertation requirements.

Requisites: Graduate/professional standing**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, unlimited number of completions**Last Taught:** Spring 2024