

SOIL SCIENCE (SOIL SCI)

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 2025

Learning Outcomes: 1. Describe the breadth of the environmental sciences field

Audience: Undergraduate

2. Explain how research contributes to understanding of contemporary environmental issues

Audience: Undergraduate

3. Provide examples of the relationships between science, issues, and solutions in environmental topics

Audience: Undergraduate

4. Apply critical reading skills to understand issues and evaluate reliability of information sources

Audience: Undergraduate

5. Communicate and collaborate with a team of peers

Audience: Undergraduate

6. Explain how to pursue interests in environmental issues within and outside of the classroom

Audience:

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 2025

Learning Outcomes: 1. Synthesize knowledge of the diversity of soils in the world

Audience: Undergraduate

2. Describe what are important soil characteristics

Audience: Undergraduate

3. Discuss how soils relate to the grand environmental challenges that confront humanity

Audience: Undergraduate

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 2025

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 2025

Learning Outcomes: 1. Describe the significance of soil and its properties

Audience: Undergraduate

2. Identify and describe key components of soil solids and pores

Audience: Undergraduate

3. Explain and predict the interaction of water with soil

Audience: Undergraduate

4. Interpret basic nomenclature used in soil science

Audience: Undergraduate

5. Analyze that causes and solutions for sustainability of soil resources

Audience: Undergraduate

6. Quantify the interaction of clay surfaces with a soil solution

Audience: Undergraduate

7. Describe the role of soils in many different ecosystems

Audience: Undergraduate

8. Link soil orders with biomes and describe soil's edaphic character

Audience: Undergraduate

9. Analyze sustainability issues using a systems-based approach

Audience: Undergraduate

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: Spring 2025

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

Learning Outcomes: 1. Develop critical, analytical, and independent thinking skills

Audience: Undergraduate

2. Apply the scientific method and engage in constructive problem solving

Audience: Undergraduate

3. Demonstrate application of research skills and methodologies

Audience: Undergraduate

4. Effectively communicate findings

Audience: Undergraduate

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 2025

Learning Outcomes: 1. Develop critical, analytical, and independent thinking skills

Audience: Undergraduate

2. Apply the scientific method and engage in constructive problem solving

Audience: Undergraduate

3. Demonstrate application of research skills and methodologies

Audience: Undergraduate

4. Effectively communicate findings

Audience: Undergraduate

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 2024

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 2024

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 assignment 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/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 2024

Learning Outcomes: 1. Use scientific vocabulary and conceptual models to describe microorganisms and fauna in soil

Audience: Both Grad & Undergrad

2. Describe challenges of living in the soil ecosystem and examples of life history traits adaptive to the soil habitat

Audience: Both Grad & Undergrad

3. Explain the relationship between soil organisms, soil organic matter, and nutrient cycling

Audience: Both Grad & Undergrad

4. Explain the importance of the roots and the soil rhizosphere

Audience: Both Grad & Undergrad

5. Discuss the concept of soilborne disease, the general life history traits of soilborne pathogens, and their relationship with the soil food web

Audience: Both Grad & Undergrad

6. Outline the techniques used in soil biology

Audience: Both Grad & Undergrad

7. Connect basic knowledge of soil biology with current global issues

Audience: Both Grad & Undergrad

8. Evaluate current and relevant research and review papers on soil biology

Audience: Both Grad & Undergrad

9. Analyze and explain a specific topic in soil biology that interests you

Audience: Both Grad & Undergrad

10. Examine peer reviewed literature related to topics in soil biology and design a discussion to evaluate findings

Audience: Graduate

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 2024

Learning Outcomes: 1. Explain and illustrate the functions of soil resources in food production

Audience: Both Grad & Undergrad

2. Identify, and summarize the connections between the soil resource and the water cycle, with special attention to its roles in water quality control, groundwater recharge, and flood buffering

Audience: Both Grad & Undergrad

3. Identify and summarize the role of soils in carbon sequestration and waste management

Audience: Both Grad & Undergrad

4. Integrate and analyze the effect of human activities on soil properties and its functions in the agricultural system, water cycling, carbon sequestration, and waste management

Audience: Both Grad & Undergrad

5. Identify, monitor and revise the policies, programs, projects, and other activities intended to protect and bolster the functions of the soil resource

Audience: Both Grad & Undergrad

6. Develop critical reading skills to understand environmental issues and design/plan effective management practices

Audience: Graduate

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 2025

Learning Outcomes: 1. Identify the essential plant nutrients and their biological functions

Audience: Both Grad & Undergrad

2. Explain sampling and analytical methods used to determine macronutrients sufficiency for healthy plant growth

Audience: Both Grad & Undergrad

3. Discuss the primary fertilizer materials used in agriculture, their sources and limitations

Audience: Both Grad & Undergrad

4. Analyze and interpret experimental data collected in the laboratory about plant growth and nutrient use efficiency

Audience: Both Grad & Undergrad

5. Describe the environmental impact of fertilizer manufacture, the impacts of nutrient loss by leaching and runoff, and best-known practices for improved fertilizer efficiency and mitigation of nutrient loss to the environment

Audience: Both Grad & Undergrad

6. Synthesize soil, cropping systems, and other critical on-farm details needed to develop a comprehensive nutrient management plan

Audience: Graduate

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 2024

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

Audience: Both Grad & Undergrad

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

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

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 2025

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

Learning Outcomes: 1. Carry out common calculations necessary for a career in turfgrass management

Audience: Both Grad & Undergrad

2. Develop a detailed fertility plan for a turf area of your choice based on principles of turfgrass nutrition and soil science

Audience: Both Grad & Undergrad

3. Interpret a variety of soil test reports

Audience: Both Grad & Undergrad

4. Interpret a detailed water quality analysis report and make judgments of the suitability of that water for a given soil type and turfgrass area

Audience: Both Grad & Undergrad

5. Schedule irrigation applications based on knowledge of soil type, weather, water quality, and water needs of the turfgrass

Audience: Both Grad & Undergrad

6. Integrate your knowledge of fertility, irrigation management, water quality, and the environment to develop a nutrient management plan that complies with Wisconsin Department of Natural Resources rules

Audience: Both Grad & Undergrad

7. Critically evaluate and synthesize peer-reviewed literature on turfgrass nutrient and water management and communicate the best practices, strategies and solutions for minimizing the impact of turfgrass management on the environment to a stakeholder group (regulatory bodies, turf managers, or environmental advocacy groups)

Audience: Graduate

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 2024

Learning Outcomes: 1. Explain the social, economic, and environmental dimensions of the sustainability challenges of grasslands

Audience: Undergraduate

2. Describe the social, economic, and environmental dimensions of grasslands and identify potential trade-offs and interrelationships among these dimensions

Audience: Both Grad & Undergrad

3. Predict the distribution, structure, function, and services of grasslands from global to local levels of resolution

Audience: Graduate

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 2024

Learning Outcomes: 1. Identify, formulate, solve complex wastewater management and engineering problems by applying engineering and science principles to design a complete residential onsite wastewater treatment system.

Audience: Undergraduate

2. Use engineering design to produce wastewater management solutions that meet treatment goals with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Audience: Undergraduate

3. Communicate effectively with the instructor and other students during in-class discussions.

Audience: Undergraduate

4. Recognize ethical and professional responsibilities in onsite wastewater management and engineering situations and make informed design assumptions/judgments, which must consider the impact of wastewater management solutions in global, economic, environmental, and societal context.

Audience: Undergraduate

5. Analyze and interpret data related to wastewater flow, source, and characteristics, soil/site characteristics, and use engineering judgement to select appropriate design solutions.

Audience: Undergraduate

6. Acquire and apply new knowledge regarding advanced treatment processes for residential wastewater treatment.

Audience: Undergraduate

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 2025

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:** Summer 2024

Learning Outcomes: 1. Apply concepts learned in coursework to authentic professional situations

Audience: Undergraduate

2. Demonstrate professional skills appropriate for the industry

Audience: Undergraduate

3. Identify and reflect on how concepts learned in coursework apply to specific work settings and situations

Audience: Undergraduate

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: Fall 2024

Learning Outcomes: 1. Build intuition and an ability to predict which kinds of organisms will be found in different ecosystems using quantitative reasoning when possible.

Audience: Undergraduate

2. Gain familiarity with research tools and applications in environmental microbiology, along with an appreciation for their limitations.

Audience: Undergraduate

3. Critically evaluate published research carried out in the field and think creatively about new potential research questions and applications.

Audience: Undergraduate

4. Work collaboratively in a team to enhance learning and solve complex problems.

Audience: Undergraduate

SOIL SCI 430 – SOIL POLLUTION AND HUMAN HEALTH

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, and microplastics. Understand the contaminant mobility in the environment and in turn, how these contaminants affect human and ecosystem health. Apply epidemiological, toxicological, and risk assessment methods to assess soil contamination impacts on local populations. Through case studies from around the world explore issues of soil contamination and interventions to mitigate health impacts.

Requisites: CHEM 103, 108, 109, 115, 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 2024

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

Audience: Both Grad & Undergrad

2. Recognize how contaminant mobility and bioavailability impact human and ecosystem health.

Audience: Both Grad & Undergrad

3. Analyze case studies to understand environmental and human health impacts and applicable contamination mitigation techniques.

Audience: Both Grad & Undergrad

4. Apply epidemiology, toxicology, and risk assessment methods to assess soil contamination impacts on local populations.

Audience: Both Grad & Undergrad

5. Evaluate scientific published literature and synthesize results for oral presentations.

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 2024

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

Learning Outcomes: 1. Apply sustainability principles and/or framework to addressing the challenge of feeding an increasing world population sustainably.

Audience: Undergraduate

2. Define and characterize sustainability, sustainable agriculture and Sustainable Development

Audience: Undergraduate

3. Analyze the contributions of animal agriculture to the Sustainable Development Goals both in developing and developed countries.

Audience: Undergraduate

4. Explain the social, economic, and/or environmental dimensions of the sustainability challenges of diverse animal agricultural systems both in developing and developed countries.

Audience: Undergraduate

5. Evaluate the role of livestock in communities where poverty, hunger and marginalization are embedded as a way of life.

Audience: Undergraduate

6. Critically evaluate the causes of –and ways to break– the chains of hunger and poverty among the poorest of the poor.

Audience: Undergraduate

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

Learning Outcomes: 1. Improve communication and interpersonal skills associated with participating in team-based intercultural experiences
Audience: Undergraduate

2. Be better prepared for professional success in an interconnected world by navigating unfamiliar cultural norms and societal differences
Audience: Undergraduate

3. Reflect on US-centric personal and cultural values while building an appreciation and respect for the Latin America culture.
Audience: Undergraduate

4. Explain the social, economic, and/or environmental dimensions of the sustainability challenge of alleviating poverty and malnutrition in Mexico
Audience: Undergraduate

5. Apply sustainability principles and/or framework to addressing the challenge of fostering prosperity in marginalized indigenous communities
Audience: Undergraduate

6. Analyze both from their own disciplinary lens and from an interdisciplinary lens the contributions of dairy farming to the Sustainable Development Goals
Audience: Undergraduate

7. Evaluate the sustainability of subsistence, market-oriented, and industrial-scale farming systems
Audience: Undergraduate

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 2024

Learning Outcomes: 1. Apply their expertise and skills from previous coursework
Audience: Undergraduate

Audience: Undergraduate

2. Practice working together in teams to accomplish goals
Audience: Undergraduate

3. Submit a product that addresses the challenge being addressed
Audience: Undergraduate

4. Communicate effectively in both written and oral form
Audience: Undergraduate

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 2025

Learning Outcomes: 1. Describe the soil environment from the perspective of a microbe

Audience: Both Grad & Undergrad

2. Explain the importance of soil microbes for globally important issues such as climate change, nutrient cycling, and biodiversity

Audience: Both Grad & Undergrad

3. Describe key methods used to study soil microbes and explain their limitations

Audience: Both Grad & Undergrad

4. Analyze microbial community data to answer the question, are the organisms in these communities different, and how

Audience: Both Grad & Undergrad

5. Discuss and critically evaluate scientific papers in soil microbiology at an advanced undergraduate level

Audience: Undergraduate

6. Conduct, analyze, and interpret a research project

Audience: Undergraduate

7. Discuss and critically evaluate scientific papers in soil microbiology at a graduate level

Audience: Graduate

8. Design, conduct, analyze, and interpret a research project, drawing on the broader literature

Audience: Graduate

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 2025

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 2024

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 2025

Learning Outcomes: 1. Describe various methods used for environmental assessment, particularly in the context of land use, resource extraction, and environmental pollution

Audience: Both Grad & Undergrad

2. Measure and evaluate environmental impacts and the effects of human activities on physical and biological resources, including soil, water, air, and biota

Audience: Both Grad & Undergrad

3. Explain the role of environmental impact statement laws and regulations in decision-making processes

Audience: Both Grad & Undergrad

4. Organize, analyze, and visualize environmental data spatially

Audience: Both Grad & Undergrad

5. Use models to understand complex interactions between natural systems and human activities

Audience: Both Grad & Undergrad

6. Analyze how environmental changes affect communities, health, and well-being

Audience: Both Grad & Undergrad

7. Evaluate the role of environmental assessment in policy-making, enforcement, and information dissemination

Audience: Both Grad & Undergrad

8. Analyze environmental data for trends and patterns

Audience: Graduate

9. Integrate data from multiple databases

Audience: Graduate

10. Critically evaluate environmental impact assessment methodologies

Audience: Graduate

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 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 2025

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

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

10. Analyze sustainability issues and/or practices on soil and environment using a systems-based approach.

Audience: Both Grad & Undergrad

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 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 2024

Learning Outcomes: 1. Identify basic reaction and chemical species of chemicals in soil

Audience: Both Grad & Undergrad

2. Predict soil chemical reactions using equations

Audience: Both Grad & Undergrad

3. Describe solid phases in soils and their surface properties

Audience: Both Grad & Undergrad

4. Critically evaluate soil chemistry literature

Audience: Both Grad & Undergrad

5. Analyze environmental and agricultural problems from a soil chemistry perspective

Audience: Both Grad & Undergrad

6. Apply concepts in environmental soil chemistry to propose research-based solutions to current issues

Audience: Graduate

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 2024

Learning Outcomes: 1. Explain the various physical models governing water, heat, gas and solute transport in soils

Audience: Both Grad & Undergrad

2. Summarize and compare the principles of various soil sensors used to measure water, heat, gas and solute status and transport in soils

Audience: Both Grad & Undergrad

3. Use Hydrus software to simulate water, heat, gas and solute transport in soils

Audience: Both Grad & Undergrad

4. Present soils physics research to scientific audience

Audience: Both Grad & Undergrad

5. Apply various soil physical models to real-world examples for improved natural resources management

Audience: Both Grad & Undergrad

6. Describe recent advances in soil physics and soil sensing technologies and identify the main research gaps in soil physics

Audience: Graduate

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 2024

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 2025

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

Learning Outcomes: 1. Review and analyze scientific literature

Audience: Undergraduate

2. Identify and use appropriate research methodologies to address a research question

Audience: Undergraduate

3. Begin structuring and writing a thesis based on original research

Audience: Undergraduate

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

Learning Outcomes: 1. Review and analyze scientific literature

Audience: Undergraduate

2. Identify and use appropriate research methodologies to address a research question

Audience: Undergraduate

3. Write a thesis based on original research

Audience: Undergraduate

SOIL SCI/ENVIR ST/LAND ARC 695 – APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS IN NATURAL RESOURCES

3 credits.

Modern GIS desktop and web-based workflows, analyses, and visualizations related to natural resource and environmental planning issues and communication. Guest lectures from agency and industry professionals.

Requisites: LAND ARC 311, 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 2025

Learning Outcomes: 1. Develop and apply appropriate geospatial analysis workflows related to the study and conservation of natural resources.

Audience: Both Grad & Undergrad

2. Identify and evaluate sources of primary and secondary geospatial data.

Audience: Both Grad & Undergrad

3. Develop methods for collecting primary geospatial data

Audience: Both Grad & Undergrad

4. Communicate analytical results in visual and graphical forms.

Audience: Both Grad & Undergrad

5. Evaluate literature related to geospatial technologies in environmental science and natural resource issues.

Audience: Graduate

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 2025

Learning Outcomes: 1. Develop critical, analytical, and independent thinking skills

Audience: Undergraduate

2. Apply the scientific method and engage in constructive problem solving

Audience: Undergraduate

3. Demonstrate application of research skills and methodologies

Audience: Undergraduate

4. Effectively communicate findings

Audience: Undergraduate

SOIL SCI 710 – SYSTEMATIC REVIEWS IN AGRICULTURE AND THE ENVIRONMENT

3 credits.

Covers how to develop a publishable systematic review for dissertations and professional work. Understand the distinguishing features of systematic review typologies and apply this understanding to selecting and conducting systematic reviews applicable to a variety of research questions in agricultural sciences.

Requisites: Consent of instructor

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

Repeatable for Credit: No

Learning Outcomes: 1. Identify the fundamentals of systematic review procedures and identify systematic review typologies requirements, strategies for repeatability/reproducibility, and publication development. Audience: Graduate

2. Use guides (e.g. PICO) and tools (e.g. Rayyan) with an emphasis on developing your own open access toolkit. Audience: Graduate

3. Assess the need and question the development of proposed systematic review. Audience: Graduate

4. Develop and register a systematic review protocol. Audience: Graduate

5. Search and evaluate peer-reviewed and grey literature. Audience: Graduate

6. Conduct eligibility screening, data extraction and coding using inclusion-exclusion criteria, tools for collaborative and rapid review, extraction templates and best practices, combining raw and summary data. Audience: Graduate

7. Synthesize results of a systematic review. Audience: Graduate

8. Characterize bias including types of bias and resulting study limitations. Audience: Graduate

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 2025

Learning Outcomes: 1. Present to an academic audience comprised of your peers, faculty, and practitioners in and outside UW-Madison Audience: Graduate

2. Assess and discuss the presentation of research related to soil science Audience: Graduate

3. Engage in a public question and answer discourse related to the presentation topic Audience: Graduate

4. Respond to constructive feedback for the purpose of assessment and self-reflection Audience: Graduate

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 2025

Learning Outcomes: 1. Research current topics in environmental contamination and remediation 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 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 2025

Learning Outcomes: 1. Develop a list of one or more learning outcomes for the activity consistent with a backward design model

Audience: Graduate

2. Communicate soil science content using the modality appropriate to the chosen audience

Audience: Graduate

3. Develop and execute an assessment plan to evaluate the learning outcomes

Audience: Graduate

4. Engage in metacognitive reflection on teaching experiences to deepen understanding, identify areas for growth, and refine instructional practices

Audience: Graduate

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 2025

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 2025

Learning Outcomes: 1. Devise an engaging overview of a research area

Audience: Graduate

2. Explain background, methods, results, and a discussion of experimental data

Audience: Graduate

3. Design charts/tables that effectively communicate data

Audience: Graduate

4. Assess peers on the effectiveness of a scientific presentation

Audience: Graduate

5. Generate goals to improve presentation skills

Audience: Graduate