

# Soil Science (SSC)

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## **SSC 112 Principles of Soil Science** (4 credit hours)

Fundamental soil physical and chemical properties and principles. Major lecture topics: soil description, formation, soil water and the hydrologic cycle, and soil fertility and fertilizers. Laboratory exercises in identifying soil horizons, determining soil texture, identifying nutrient deficiency symptoms in plants and interpreting soil fertility test reports.

Requisite: Agricultural Institute Only  
Typically offered in Fall and Spring

## **SSC 151 Fertilizers and Soil Fertility** (3 credit hours)

Principles of managing plant nutrients in soils for crop, turfgrass and other plant production; nutrient requirements; deficiency symptoms; nutrient availability in soils; soil acidity and liming; fertilizer materials; organic fertilizers; and environmental effects of fertilizers.

Requisite: Agricultural Institute Only; Prerequisite: SSC 112  
Typically offered in Spring only

## **SSC 185 Land and Life** (3 credit hours)

Soil is a fundamental natural resource that sustains life on earth. Detailed information is provided about soils at local, community, regional, national, and global scales; and their importance to world food security and human health, agricultural production, environmental quality, and sustainable ecosystems. Students will gain practical knowledge about soils, their use and management, and their critical role in supporting life. Understanding basic soil properties, their interactions, and how they are influenced or impacted by human activity is essential to everyday life and to being a well-informed citizen.

*GEP Interdisciplinary Perspectives*  
Typically offered in Fall and Spring

## **SSC 200 Soil Science** (3 credit hours)

Fundamentals of soils including origin, composition and classification; their physical, chemical, and biological properties; significance of these properties to soil-plant relationships and soil management.

Prerequisite: CH 101 or CH 100  
*GEP Natural Sciences*  
Typically offered in Fall and Spring

## **SSC 201 Soil Science Laboratory** (1 credit hours)

Hands-on laboratory experience in fundamentals of soils including origin, composition and classification; their physical, chemical, and biological properties; significance of these properties to soil-plant relationships, soil management and the environment.

Corequisite: SSC 200  
*GEP Natural Sciences*  
Typically offered in Fall and Spring

## **SSC 332 Environmental Soil Microbiology** (3 credit hours)

Analysis of the effects of soil environments on microbial growth. Relationships and significance of microbes to mineral transformations, plant development, and environmental quality. Management of soil microorganisms in different ecosystems.

Prerequisite: BIO 181 and SSC 200  
Typically offered in Spring only

## **SSC 341 Soil Fertility and Nutrient Management** (3 credit hours)

The course provides detailed information on plant nutrition, soil fertility, and management of essential plant nutrients and other amendments affecting plant growth and nutrition. The influence of numerous biological, physical, and chemical soil properties on plant nutrient availability will be emphasized. Students will be familiar with contemporary diagnostic tools to assess nutrient availability, and the soil and nutrient management technologies essential for enhancing soil and plant productivity while minimizing the impact of nutrient use on the environment.

Prerequisite: SSC 200  
Typically offered in Fall, Spring, and Summer

## **SSC 342 Soil and Plant Nutrient Analysis** (1 credit hours)

The course provides detailed information on (1) the chemical methods utilized in routine soil testing and plant analysis, (2) field soil sampling techniques, (3) nutrient recommendations, (4) nutrient response functions, and (5) nutrient management planning. Students gain essential experience in interpreting soil, plant, waste, and water analysis reports, and how these data are used in soil and crop management decisions. Course material will be presented in lecture and laboratory format.

Prerequisite: SSC 341  
Typically offered in Fall and Spring

## **SSC 410 Soil Judging for Land Evaluation** (1 credit hours)

Lecture and field-based course on describing, classifying, and interpreting soils in their natural setting. Topics will focus on a particular land region that will change each term. The course is in preparation for the regional soil judging contest in the Fall and the national soil judging contest in the Spring. Lectures explain land evaluation techniques and include soil morphology, genesis, and classification. Urban and agricultural applications will be considered. The course meets once per week for 8 weeks. Three field trips will be required and count as field work. The weekly meeting time is TBA. Students who complete the class have the option of participating in a regional, intercollegiate, Soil Judging Contest during each fall semester. Participation in the national contest during the spring semester depends on qualifying at the regional level the previous fall.

Prerequisite: SSC 200  
Typically offered in Fall only

## **SSC 427/SSC 527 Biological Approaches to Sustainable Soil Systems** (3 credit hours)

Ecological and biochemical concepts will be applied to managing soils in agro-ecological settings such as organic and conventionally managed farms and gardens, emphasizing microbial transformations of nutrients and matter. Topics covered include soil organic matter formation and fractionation, decomposition, microbial assimilation of nutrients, fertilizer management, tillage, crop rotations, cover crop management. Companion course SSC 428 and SSC 341 recommended.

Prerequisite: SSC 200 or equivalent, BIO 181 or 183, and CH 101  
Typically offered in Fall only

**SSC 428/HS 428 Soil Management Principles for Sustainable Agriculture** (1 credit hours)

The course is designed to be taken as a companion course to SSC 427 and provides hands-on field and lab experiences that investigate the fundamentals of soil carbon, soil health, greenhouse gas emissions as influenced by sustainable management practices. This is accomplished through a series of exercises at the Fyke Crops Garden, Agroecology Farm and in the lab, and site visits to the Center for Environmental Farming, composting facilities, and operational farms.

Prerequisite: SSC 200 or equivalent and BIO 181 or 183; Corequisite: SSC 427

*Typically offered in Fall only*

**SSC 440/SSC 540 Geographic Information Systems (GIS) in Soil Science and Agriculture** (3 credit hours)

Geographic information systems (GIS), global positioning system (GPS), and remote sensing to manage spatially variable soils, vegetation, other natural resources. Develop: function understanding of GIS principles, working knowledge of ArcGIS, problem-solving/critical-thinking necessary to use GIS to characterize and manage soils, agriculture, natural resources. Introduction to GIS; Maps/Cartography; Vectors/Raster Data Models; Georeferencing/Coordinate Systems; Spatial Data Sources; GPS/GPS skills/ Remote Sensing; Statistics/Interpolation; Precision Agriculture; Computer Aided Design and GIS; Creating Analyzing 3-D Surfaces. Credit not given for both SSC 440 and SSC 540.

Prerequisite: SSC 200

*Typically offered in Fall only*

**SSC 442 Soil and Environmental Biogeochemistry** (3 credit hours)

Quantitative approaches to the cycling of elements and chemical species in soils and the environment, including carbon and organic contaminants, non-metallic macronutrients, metals and metalloids.

Prerequisite: SSC 200 and (CH 101, or CH 201, or CH 220, or CH 221)

*Typically offered in Spring only*

**SSC 452 Soil Classification** (4 credit hours)

Genesis, morphology, and classification of soils; characterization of soils according to their diagnostic properties; interpreting soil use potential; emphasis on North Carolina soils and their taxonomy; field exercise in soil mapping and site evaluation; several field trips, one overnight.

Prerequisite: SSC 200

*Typically offered in Spring only*

**SSC 455 Soils, Environmental Quality and Global Challenges** (3 credit hours)

As the world population grows to 9 billion people by 2050, we will be pressed to increase food security, respond to the consequences of a changing climate, and improve human health -- all while protecting the environment and maintaining natural resources. Soils play a critical role in many of these challenges. The goal of this course is to teach students how soils regulate environmental quality through a host of chemical, physical and biological processes. We will examine a series of global challenges, assess their related environmental issues and policies, and analyse the roles of soils in each issue.

P: SSC 200 or ES 100 or Instructor permission

*Typically offered in Fall only*

**SSC 461 Soil Physical Properties and Plant Growth** (3 credit hours)

Soil physical properties and their influence on plant growth and environmentally sound land use; soil solid-porosity-density relationships, soil water, heat and air relations and transport. Principles and applications of these topics using current literature in agronomy, turf, horticulture, water quality, waste management and urban land use.

Prerequisite: SSC 200

*Typically offered in Fall only*

**SSC 462 Soil-Crop Management Systems** (3 credit hours)

Unites principles of soil science and crop science with those of allied areas into realistic agronomic applications; practical studies in planning and evaluation of soil and crop management systems.

Prerequisite: CS 213 and CS 414 and SSC 342 and Senior standing

*Typically offered in Spring only*

**SSC 470/SSC 570 Wetland Soils** (3 credit hours)

Wetland definitions, concepts, functions and regulations; chemical, physical and morphological characteristics of wetland soils. Wetland soil identification using field indicators and monitoring equipment; principles of wetland creation, restoration and mitigation. Special project required for SSC 570. Two mandatory field trips. Field trips for distance education students are not required but optional. Credit will not be given for both SSC 470 and SSC 570.

Prerequisite: SSC 200, SSC 452 recommended

*Typically offered in Fall, Spring, and Summer*

**SSC 473/BAE 473/BAE 573/SSC 573 Introduction to Hydrologic and Water Quality Modeling** (3 credit hours)

Concepts in basic hydrologic, erosion and chemical transport used in modeling. Evaluation of typical hydrologic and water quality models on watershed systems. Project examples using state-of-the-art models. Credit will not be given for both BAE 473 and BAE 573.

Prerequisite: BAE 371

*Typically offered in Fall only*

**SSC 511 Soil Physics** (4 credit hours)

Soil physical properties and theory of selected instrumentation to measure them. Topics including soil solids, soil water, air and heat. Emphasis on transport processes and the energy concept of soil and water.

Prerequisite: SSC 200, PY 212

*Typically offered in Fall only*

**SSC 521 Soil Chemistry** (3 credit hours)

A consideration of the chemical and colloidal properties of clay and soil systems, including ion exchange and retention, soil solution reactions, solvation of clays and electrokinetic properties of clay-water systems.

Prerequisite: SSC 200, one yr. of general inorganic chemistry

*Typically offered in Spring only*

**SSC 527/SSC 427 Biological Approaches to Sustainable Soil Systems** (3 credit hours)

Ecological and biochemical concepts will be applied to managing soils in agro-ecological settings such as organic and conventionally managed farms and gardens, emphasizing microbial transformations of nutrients and matter. Topics covered include soil organic matter formation and fractionation, decomposition, microbial assimilation of nutrients, fertilizer management, tillage, crop rotations, cover crop management. Companion course SSC 428 and SSC 341 recommended.

Prerequisite: SSC 200 or equivalent, BIO 181 or 183, and CH 101  
*Typically offered in Fall only*

**SSC 532/MB 532 Soil Microbiology** (4 credit hours)

Soil as a medium for microbial growth, the relation of microbes to important mineral transformations in soil, the importance of biological equilibrium and significance of soil microbes to environmental quality.

Prerequisite: MB 351, CH 220

**SSC 535/CS 535 Root and Rhizosphere Processes for Plant Nutrition** (3 credit hours)

The focus of this course is on the understanding of concepts and principles of plant hydro-mineral acquisition, plant adaptation to nutrient deficiencies, water and nutrient cycles in the soil, and the impact that microbial communities have on these processes. Understanding below ground biological networks and their complexity is crucial for understanding soil fertility and improving the acquisition of nutrients in natural and agroecosystems.

Prerequisite: Graduate Standing or Instructor permission  
*Typically offered in Fall only*

**SSC 540/SSC 440 Geographic Information Systems (GIS) in Soil Science and Agriculture** (3 credit hours)

Geographic information systems (GIS), global positioning system (GPS), and remote sensing to manage spatially variable soils, vegetation, other natural resources. Develop: function understanding of GIS principles, working knowledge of ArcGIS, problem-solving/critical-thinking necessary to use GIS to characterize and manage soils, agriculture, natural resources. Introduction to GIS; Maps/Cartography; Vectors/Raster Data Models; Georeferencing/Coordinate Systems; Spatial Data Sources; GPS/GPS skills/ Remote Sensing; Statistics/Interpolation; Precision Agriculture; Computer Aided Design and GIS; Creating Analyzing 3-D Surfaces. Credit not given for both SSC 440 and SSC 540.

Prerequisite: SSC 200  
*Typically offered in Fall only*

**SSC 541 Soil Fertility** (3 credit hours)

Soil conditions affecting plant growth and the chemistry of soil and fertilizer interrelationships. Factors affecting the availability of nutrients. Methods of measuring nutrient availability.

Prerequisite: SSC 341

**SSC 551 Soil Morphology, Genesis and Classification** (3 credit hours)

Morphology: Chemical, physical and mineralogical parameters useful in characterizing soil. Genesis: soil-forming factors and processes. Classification: historical development and present concepts of soil taxonomy with particular reference to worldwide distribution of great soil groups as well as discussions of logical bases of soil classification.

Prerequisite: SSC 200

**SSC 562 Environmental Applications Of Soil Science** (3 credit hours)

Identification and evaluation of basic factors influencing movement of potential pollutants through soil and their underlying strata. Development of understanding of processes of soil and site evaluation for waste disposal and transport of pollutants through soils.

Prerequisite: SSC 200  
*Typically offered in Spring only*

**SSC 570/SSC 470 Wetland Soils** (3 credit hours)

Wetland definitions, concepts, functions and regulations; chemical, physical and morphological characteristics of wetland soils. Wetland soil identification using field indicators and monitoring equipment; principles of wetland creation, restoration and mitigation. Special project required for SSC 570. Two mandatory field trips. Field trips for distance education students are not required but optional. Credit will not be given for both SSC 470 and SSC 570.

Prerequisite: SSC 200, SSC 452 recommended  
*Typically offered in Fall, Spring, and Summer*

**SSC 573/SSC 473/BAE 473/BAE 573 Introduction to Hydrologic and Water Quality Modeling** (3 credit hours)

Concepts in basic hydrologic, erosion and chemical transport used in modeling. Evaluation of typical hydrologic and water quality models on watershed systems. Project examples using state-of-the-art models. Credit will not be given for both BAE 473 and BAE 573.

Prerequisite: BAE 371  
*Typically offered in Fall only*

**SSC 590 Special Problems in Soil Science** (1-6 credit hours)

Special problems in various phases of soils. Emphasis placed on review of recent and current research. Credits arranged in consultation with sponsoring faculty member.

Prerequisite: Master's or PhD Student  
*Typically offered in Fall, Spring, and Summer*

**SSC 592 Special Topics in Soil Science** (1-6 credit hours)

Special Topics in Soil Science. Topics of contemporary interest in soil science presented in an experimental or pilot course format.

P: Graduate Standing  
*Typically offered in Fall, Spring, and Summer*

**SSC 601 Seminar** (1 credit hours)

A maximum of two semester hours allowed toward the master's degree, but any number toward the doctorate. Scientific articles, progress reports in research and special problems of interest to soil scientists reviewed and discussed.

Prerequisite: Graduate standing in SSC  
*Typically offered in Fall and Spring*

**SSC 609 Colloquium In Soil Science** (1-3 credit hours)

Seminar-type discussions and lectures on specialized and advanced topics in soil science. Credits Arranged

Prerequisite: Graduate standing in SSC  
*Typically offered in Fall and Spring*

**SSC 620 Special Problems** (1-6 credit hours)

Special problems in various phases of soils. Emphasis placed on review of recent and current research. Credits Arranged

Prerequisite: SSC 200

*Typically offered in Fall and Spring*

**SSC 675 Project in Soil Science** (1-6 credit hours)

Credit for required, independent project in soil science for the Master of Soil Science degree program. Project topic and learning contract will be developed with, and approved by, the student's faculty advisor and the Director of Graduate Programs. May be repeated for a maximum of 6 credit hours towards the Master of Soil Science degree. May not be taken by Master of Science or PhD students.

R: Master of Soil Science (MR) students only

*Typically offered in Fall, Spring, and Summer*

**SSC 685 Master's Supervised Teaching** (1-3 credit hours)

Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment. No more than 1 credit per course section taught.

Prerequisite: Master's student

*Typically offered in Fall and Spring*

**SSC 688 Non-Thesis Masters Continuous Registration - Half Time Registration** (1 credit hours)

For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student

*Typically offered in Summer only*

**SSC 689 Non-Thesis Master Continuous Registration - Full Time Registration** (3 credit hours)

For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student

*Typically offered in Summer only*

**SSC 690 Master's Exam** (1-9 credit hours)

For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam. Credits Arranged

Prerequisite: Master's student

*Typically offered in Spring and Summer*

**SSC 693 Master's Supervised Research** (1-9 credit hours)

Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student

*Typically offered in Fall, Spring, and Summer*

**SSC 695 Master's Thesis Research** (1-9 credit hours)  
Thesis Research

Prerequisite: Master's student

*Typically offered in Fall, Spring, and Summer*

**SSC 696 Summer Thesis Research** (1 credit hours)

For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student

*Typically offered in Summer only*

**SSC 699 Master's Thesis Preparation** (1-9 credit hours)

For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits arranged

Prerequisite: Master's student

*Typically offered in Fall, Spring, and Summer*

**SSC 720 Soil and Plant Analysis** (3 credit hours)

Theory and advanced principles of utilization of chemical instruments to aid research on the heterogeneous systems of soils and plants.

Prerequisite: PY 212; CH 315; at least three soils courses including SSC 341

*Typically offered in Spring only*

*This course is offered alternate years*

**SSC 725/TOX 725/CS 725/HS 725 Pesticide Chemistry** (1 credit hours)

Chemical properties of pesticides including hydration and solvation, ionization, volatilization, lipophilicity, molecular structure and size, and reactivity and classification according to chemical description, mode of action or ionizability. Taught during the first 5 weeks of semester. Drop date is last day of 3rd week of the minicourse.

Prerequisite: (CH 201 or CH 203) and (CH 221 or CH 225)

*Typically offered in Spring only*

**SSC 727/TOX 727/CS 727/HS 727 Pesticide Behavior and Fate In the Environment** (2 credit hours)

Sorption/desorption, soil reactivity, movement, volatilization, bioavailability, degradation and stability of pesticides in the environment. Taught during the last 10 weeks of semester. Drop date is last day of 3rd week of the minicourse.

Prerequisite: CS(HS,SSC,TOX) 725,SSC 200

*Typically offered in Spring only*

**SSC 790 Special Topics** (1-6 credit hours)

The study of special problems and selected topics of current interest in soil science and related fields.

*Typically offered in Fall only*

**SSC 801 Seminar** (1 credit hours)

Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

*Typically offered in Fall and Spring*

**SSC 809 Colloquium In Soil Science** (1-3 credit hours)

Seminar-type discussions and lectures on specialized and advanced topics in soil science. Credits Arranged

Prerequisite: Graduate standing in SSC

*Typically offered in Fall, Spring, and Summer*

**SSC 820 Special Problems** (1-6 credit hours)

Special problems in various phases of soils. Emphasis placed on review of recent and current research. Credits Arranged

Prerequisite: Graduate standing in Soil Science

*Typically offered in Fall and Spring*

**SSC 885 Doctoral Supervised Teaching** (1-3 credit hours)

Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment. No more than 1 credit per course section taught.

Prerequisite: Doctoral student

*Typically offered in Fall and Spring*

**SSC 890 Doctoral Preliminary Examination** (1-9 credit hours)

For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student

*Typically offered in Spring and Summer*

**SSC 893 Doctoral Supervised Research** (1-9 credit hours)

Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student

*Typically offered in Fall, Spring, and Summer*

**SSC 895 Doctoral Dissertation Research** (1-9 credit hours)

Dissertation research.

Prerequisite: Doctoral student

*Typically offered in Fall, Spring, and Summer*

**SSC 896 Summer Dissertation Research** (1 credit hours)

For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student

*Typically offered in Summer only*

**SSC 899 Doctoral Dissertation Preparation** (1-9 credit hours)

For students who have completed all credit hour, full-time enrollment, preliminary examination and residency requirements for the doctoral degree and are writing and defending their dissertations.

Prerequisite: Doctoral student

*Typically offered in Fall, Spring, and Summer*