Soil Science (SSC)

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. BROOME

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, Spring, and Summer

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 322 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 and Spring

SSC 421 Role of Soils in Environmental Management (3 credit hours)
Importance of soils in land application of municipal, industrial and agricultural wastes; onsite disposal of domestic wastewater; bioremediation of contaminated sites; erosion and sedimentation control; farm nutrient management; and nonpoint source water pollution.

Prerequisite: SSC 200
Typically offered in Fall and Spring

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 428/HS 428 Service-Learning in Urban Agriculture Systems (1 credit hours)
Course provides students a hands-on experience in urban agriculture with under-served youth in the Raleigh area. Students partner with a community gardening organization to provide knowledge and experience in soil science and agriculture to youth with the goals of increasing urban food security and developing student leadership skills. Particular emphasis is placed on reflecting on course activities and deepening of skills related to extension, outreach, and working with diverse populations. Course designed to be taken as a companion course to SSC 427, however can be taken as a stand-alone course.
Prerequisite: SSC 200 or equivalent, BIO 181 or 183, and CH 101
GEP U.S. Diversity
Typically offered in Spring 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; Vector/Raster Data Models; Georeferencing/Coordinate Systems; Spatial Data Sources; GPS/GPS skills/ Remote Sensing; Statistics/Interpolation; Precision Agriculture; Computer Aided Design and GIS; Creating Analizing 3-D Surfaces. Credit not given for both SSC 440 and SSC 540.
Prerequisite: SSC 200
Typically offered in Fall and Spring

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.
Prerequisite: 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 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: SSC 200 or PB 321, or consent of instructor
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; Vector/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 Spring 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 545  Remote Sensing Applications in Soil Science and Agriculture (3 credit hours)
Overview of remote sensing including history, evolution, vocabulary, and physical principles, i.e., electromagnetic radiation and its interaction with matter. Distant and proximate remote sensing techniques (aerial photography, satellite imaging, radar, lidar, etc.), hardware, and platforms and their application in the characterization and management of soils and crops. Development of strategies for incorporating remote sensing into soil and agronomic research, and of practical skills for processing, analysis, display, and discussion of remote sensing data with applications in soil science and agriculture.
Prerequisite: SSC 200, PY 212

SSC 551  Soil Morphology, Genesis and Classification (3 credit hours)
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: SSC 200 or consent of instructor.
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.
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 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.

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 Fall, Spring, and Summer*

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 Fall, Spring, and Summer*

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 Fall, 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*

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 771/BAE 771  **Theory Of Drainage--Saturated Flow**  (3 credit hours)
Discussion of physical concepts and properties of fluids and porous media in relation to soil-water movement. Derivation and discussion of the fundamental laws and equations governing saturated flow in porous media. Analysis of mathematical solutions of steady-state and transient flow equations to determine their applicability to drainage problems. Consideration of analogs and models of particular drainage problems.

Prerequisite: MA 301  
*Typically offered in Fall 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: SSC 200  
*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.

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 Fall, 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*