

## **Graduate Courses Offered**

**CRSS(HORT) 4140/6140. Plant Breeding.** 3 hours.

Oasis Title: PLANT BREEDING.

Not open to students with credit in CRSS 4040/6040.

Undergraduate prerequisite: PGEN 3580 or permission of department.

Fundamental principles and theories utilized in the science of plant breeding and cultivar development and the role breeding plays in crop improvement.

Offered every year.

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**(CRSS)(ECOL)(ENGR)FORS(GEOG)(GEOL) 4170L/6170L. Hydrology, Geology, and Soils of Georgia.** 3 hours.

Oasis Title: HYDROLOGY FIELD LAB.

Prerequisite: Permission of school.

This field course focuses on the physical environment of Georgia by examining the diverse geology, soils, and surface and subsurface hydrologic processes within the state. We will travel to all of Georgia's physiographic areas, visiting mines, farms, forests, wetlands, rivers, lakes, and estuaries to explore the influence of human activities on the physical environment.

Non-traditional format: This is a Maymester field course, with lectures and laboratories scheduled during the entire session. Students are expected to travel throughout the state. Class will begin Period 1 on Day 1, and will end on the last day of the session.

Offered summer semester every year.

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**CRSS(PBIO) 4210/6210. Seed Physiology.** 3 hours.

Oasis Title: SEED PHYSIOLOGY.

Undergraduate prerequisite: [CHEM 2100 or CHEM 2211 or BCMB(BIOL)(CHEM) 3100 or BCMB 4010/6010] and [PGEN 3580 or GENE(BIOL) 3200 or PBIO(CRSS)(BIOL) 4500/6500].  
Graduate prerequisite: [BCMB 4010/6010 or BCMB 6000] and [PBIO(CRSS)(BIOL) 4500/6500 or PBIO 8100].

Undergraduate corequisite: CRSS 3300 or HORT 4210/6210 or HORT(CRSS) 4440/6440-4440L/6440L or PBIO 3830-3830L.

Graduate corequisite: HORT 4210/6210 or HORT(CRSS) 4440/6440-4440L/6440L or PBIO 6830.

Regulation of anabolic and catabolic events during seed development, maturation, and germination processes. Ecophysiological consequences of dormancy variables, and agricultural and industrial significance of seed physiology.

Offered fall semester every year.

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**CRSS 4220/6220. Topics in Crop and Soil Sciences.** 1-4 hours. Repeatable for maximum 12 hours credit.

Oasis Title: TOPICS IN CROP SOIL.

Topics and methods in Crop and Soil Sciences with a different timely topic each semester, including new areas of inquiry in crop and soil sciences.

Non-traditional format: This course provides students with exposure to evolving areas of crop and soil sciences. Credit hours are variable based upon topic covered in a particular semester.

This course is also offered through University System of Georgia Independent Study (USGIS).  
Offered fall, spring, and summer semesters every year.

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**(CRSS)ENTO(PATH) 4250/6250-4250L/6250L. Pesticides and Transgenic Crops.** 3 hours. 3 hours lecture and 2 hours lab per week.

Oasis Title: PEST & TRANS CROPS.

Undergraduate prerequisite: CHEM 1212 and CHEM 1212L.

Practical management and utilization of pesticides in urban and agricultural environments. Subject areas include classification of insecticides, herbicides, and fungicides, etc., their general chemical and toxicological properties, deployment philosophy, hazards and environmental impact, formulation and application, safety and disposal, and management of pesticide resistance.

Offered spring semester every year.

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**CRSS 4260/6260. Forage Management and Utilization.** 3 hours.

Oasis Title: FORAGE MAN UTIL.

Undergraduate prerequisite: CRSS 2010-2010L or permission of department.

Characteristics of forage species; establishment, physiology, and morphology effects on management; forage quality and utilization by livestock; grazing management; hay and silage; forages for wildlife and conservation.

Offered every year.

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**CRSS 4310/6310-4310L/6310L. Seed Technology.** 3 hours. 2 hours lecture and 2 hours lab per week.

Oasis Title: SEED TECHNOL.

Undergraduate prerequisite: BIOL 1107-1107L.

Discuss and/or demonstrate concepts, theories, principles, and technologies involved in seed anatomy and structure, development, handling, dissemination, and processing. The seed development process, from breeder seed through foundation, registered and certified will be discussed. Emphasis will be placed on seed of genetically engineered and modified crops, PVP and patented cultivars, and royalties associated with these type seed. All aspects of seed storage and conditioning will be explored.

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**CRSS 4340/6340. Weed Science.** 3 hours.

Oasis Title: WEED SCIENCE.

Prerequisite: CHEM 1211 and CHEM 1211L.

Fundamentals of weed biology; cultural and chemical weed control; properties and uses of herbicides and herbicide application equipment; and current systems for weed management in cropping programs.

Non-traditional format: This course is also offered through University System of Georgia Independent Study (USGIS).

Offered fall semester every year.

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**CRSS 4340L/6340L. Weed Science Laboratory.** 1 hour. 2 hours lab per week.

Oasis Title: WEED SCI LAB.

Undergraduate corequisite: CRSS 4340/6340.

Weed identification; symptomology of herbicide action; calibration of herbicide application equipment.

Offered fall semester every year.

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**(CRSS)GEOG 4375/6375. GIS Applications in Agriculture.** 4 hours.

Oasis Title: GIS APP IN AGRIC.

Undergraduate prerequisite: CRSS 3050-3050L or CRSS(FORS) 3060-3060L or ENGR 1120 or GEOG 4330/6330-4330L/6330L or GEOG 4370/6370-4370L/6370L.

An exploration of the uses of Geographic Information Science (GIS) technology in agricultural applications. Basics of Global Positioning Systems (GPS) for location reference, GIS for field investigation, and remote sensing for crop and soil evaluation will be explored. Construction of GIS databases for precision farming and watershed management applications will be required.

Offered fall semester every year.

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**CRSS 4400/6400. Crop Ecology.** 3 hours.

Oasis Title: CROP ECOLOGY.

Undergraduate prerequisite: CRSS 2010-2010L or P BIO 1210-1210L or permission of major.

World population growth and food production problems; origin, distribution, and adaptation of tropical, subtropical, and temperate crop plants as influenced by environment with emphasis on climatic factors.

Offered every year.

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**(CRSS)HORT 4440/6440-4440L/6440L. Environmental Physiology.** 3 hours. 2 hours lecture and 3 hours lab per week.

Oasis Title: ENV PHYSIOLOGY.

Not open to students with credit in BTNY 3830-3830L or BTNY 8890-8890L, P BIO 8890-8890L or CRSS 3300 or P BIO 3830-3830L.

Undergraduate prerequisite: (CHEM 1211 and CHEM 1211L and BIOL 1103 and BIOL 1103L and BIOL 1104 and BIOL 1104L) or (BIOL 1107-1107L and BIOL 1108-1108L) or (P BIO 1210 and P BIO 1210L and P BIO 1220 and P BIO 1220L).

Effects of environmental factors on growth and physiology of horticultural plants and modification of the plant's environment to improve crop production.

Offered fall semester every year.

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**(CRSS)(BIOL)P BIO 4500/6500. Introduction to Gene Technology.** 3 hours.

Oasis Title: GENE TECHNOLOGY.

Not open to students with credit in BTNY(CRSS)(BIOL) 4500/6500.

Undergraduate prerequisite: GENE(BIOL) 3200.

Methods and applications of gene technology (recombinant DNA) and related concepts in molecular biology. These will include structure and synthesis of macromolecules; cDNA and genomic cloning, polymerase chain reaction; molecular markers and mapping; gene isolation strategies; and various host-vector systems.

Offered every year.

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**CRSS 4510/6510. Contaminants in Soil and Water.** 3 hours.

Oasis Title: CONTAM SOIL WATER.

Undergraduate prerequisite: [CRSS 4600/6600-4600L/6600L and CRSS(MIBO) 4610/6610-4610L/6610L and CRSS 4670/6670] or permission of major.

Fate and transport of contaminants; monitoring and remediation of pollution; sources, extent, and characteristics of pollution; risk assessment and management.

Offered every year.

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**CRSS 4520/6520-4520L/6520L. Field Soil and Site Assessment.** 3 hours. 2 hours lecture and 2 hours lab per week.

Oasis Title: FIELD SITE ASSESSMT.

Undergraduate prerequisite: (CRSS(GEOL) 4540/6540-4540L/6540L and CRSS 4600/6600-4600L/6600L) or permission of department.

How to assess a site to determine if the soil places any limitations on land use. Topics covered include soil sampling, soil landscapes, wetland and hydric soils, septic systems, and land application of waste.

Offered every year.

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**CRSS(GEOL) 4540/6540-4540L/6540L. Pedology.** 3 hours. 2 hours lecture and 3 hours lab per week.

Oasis Title: PEDOLOGY.

Undergraduate prerequisite: CRSS(FORS) 3060-3060L.

Soils as a natural component of the ecosystem, including morphology, landscape distribution, formation, identification of diagnostic horizons and features, and classification.

Non-traditional format: A one-day trip to North Georgia and a two-day trip to the Coastal Plain will be required at student's expense.

Offered every year.

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**CRSS 4580/6580-4580L/6580L. Soil Erosion and Conservation.** 3 hours. 2 hours lecture and 2 hours lab per week.

Oasis Title: EROSION AND CONSERV.

Prerequisite: CRSS(FORS) 3060-3060L or permission of department.

Mechanisms of soil erosion and sediment production; infiltration, runoff, and sediment transport in agricultural, forestry, and urban environments. Erosion and sediment control principles and practices. Impact of erosion and sediment on productivity and environmental quality.

Offered fall semester every year.

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**CRSS(HORT) 4590/6590. Soil Fertility and Plant Nutrition.** 3 hours.

Oasis Title: SOIL FERT PLANT NUT.

Undergraduate prerequisite: CRSS(FORS) 3060-3060L and CHEM 1211 and CHEM 1211L.

Soil conditions affecting availability of plant nutrients; methods of determining soil fertility and insufficiency of plant nutrients in soils, and interpretation of chemical and biological measurements as related to fertility maintenance and good soil management.

Offered fall semester every year.

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**CRSS(HORT) 4590L/6590L. Soil Fertility and Plant Nutrition Laboratory.** 1 hour. 2 hours lab per week.

Oasis Title: SOIL FERT NUT LAB.

Undergraduate prerequisite: CRSS(FORS) 3060-3060L and CHEM 1211 and CHEM 1211L.

Corequisite: CRSS(HORT) 4590/6590.

Methods of determining soil fertility and insufficiency of plant nutrients in soils.

Offered fall semester every year.

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**CRSS 4600/6600-4600L/6600L. Soil Physics.** 4 hours. 3 hours lecture and 2 hours lab per week.

Oasis Title: SOIL PHYSICS.

Undergraduate prerequisite: [(CRSS 3050-3050L or CRSS(FORS) 3060-3060L) and MATH 2200 and (PHYS 1111-1111L or PHYS 1211-1211L)].

Graduate prerequisite: MATH 2210.

Physical properties and process of soils. Water, heat, and solute movement in soils.

Offered every year.

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**CRSS(MIBO) 4610/6610-4610L/6610L. Soil Microbiology.** 3 hours. 1 hour lecture and 4 hours lab per week.

Oasis Title: SOIL MICROBIOLOGY.

Microorganisms in soil and their effect on nutrient recycling, especially as it relates to environmental quality and crop production.

Offered every year.

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**CRSS 4660/6660-4660L/6660L. Chemical Analysis of Environmental Samples.** 3 hours. 2 hours lecture and 3 hours lab per week.

Oasis Title: CHEM ANAL ENVIRON.

Undergraduate prerequisite: CHEM 1212 and CHEM 1212L.

Analysis of soils, sediment, rocks, water for important organic and inorganic contaminants.

Chromatography, atomic adsorption, and plasma emission spectroscopy, field sampling and measurements. Quality assurance/quality control, data reporting, computer use in analysis.

Offered every year.

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**CRSS 4670/6670. Environmental Soil Chemistry.** 3 hours.

Oasis Title: ENV SOIL CHEM.

Undergraduate prerequisite: CRSS 3050-3050L or CRSS(FORS) 3060-3060L or permission of department.

Environmental soil chemistry applies and extends the concepts of chemistry and physics to the investigation of problems related to the physical, chemical, and biological characteristics of soil and their importance in relation to the management of contaminants, pesticides, and production inputs.

Offered fall semester every year.

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**(CRSS)ENTO(PATH) 4740/6740-4740L/6740L. Integrated Pest Management.** 3 hours. 3 hours lecture and 2 hours lab per week.

Oasis Title: INTEGRATED PEST MGT.

Prerequisite: ENTO 3740-3740L or PATH 3530-3530L or CRSS 4340/6340.

The utilization and integration of pest control tactics (cultural methods, biological control, pesticides, host resistance) for management of insects, pathogens, and weeds. The major methodologies for controlling pests are discussed individually and within the context of

profitable production of selected commodities followed by discussion of multiple pest management using integrated control techniques.

Offered spring semester every year.

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**(CRSS)HORT 4800/6800. Agricultural Biotechnology.** 3 hours.

Oasis Title: AGRIC BIOTECH.

Undergraduate prerequisite: BIOL 1107-1107L and CHEM 1211 and CHEM 1211L.

Structure/manipulation of DNA and inheritance of genes, the current impact of biotechnology on crop production and animal agriculture. Regulatory, intellectual property, environmental, and market issues specific to transgenic crops.

Non-traditional format: This course will be offered only on the Tifton campus.

Offered fall semester every year.

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**CRSS(ANTH)(ECOL)(GEOG)(HORT) 4930/6930. Agroecology of Tropical America.** 3 hours.

Oasis Title: AGROECOLOGY TROP AM.

Undergraduate prerequisite: Permission of department.

Crops and cropping systems in tropical America; influences of geography, climate, and socioeconomic factors, as well as the impact of agriculture, on the ecosystems of the region.

Offered spring semester every year.

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**CRSS(ANTH)(ECOL)(GEOG)(HORT) 4931/6931. Agroecology of Tropical America Field Trip.** 3-6 hours. Repeatable for maximum 9 hours credit.

Oasis Title: AGECOL TRP FIELD TR.

Not open to students with credit in CRSS(HORT)(ANTH) 4940/6940.

Prerequisite: CRSS(HORT)(ANTH)(ECOL)(GEOG) 4930/6930 or permission of department.

Intensive field study in a tropical Latin American country; crops and cropping systems of tropical America; influences of geography, climate, and socioeconomic factors, as well as the impact of agriculture on the ecosystems of the region. Conducted in a tropical Latin American country.

Non-traditional format: Students will tour a tropical country and receive on-site instruction at a series of different farms and ecological preserves over a period of 18 days.

Offered summer semester every year.

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**(CRSS)FORS 5330/7330-5330L/7330L. Wildlife Management in Agricultural Ecosystems.** 3 hours. 2 hours lecture and 3 hours lab per week.

Oasis Title: WILDL & AGRICULTURE.

Impact of agricultural practices on the suitability of farmland for wildlife habitat and wildlife biodiversity. Introduction of management systems that enhance wildlife populations. Focus on agriculture and wildlife in Georgia, but including national and international issues.

Offered fall semester every odd-numbered year.

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**CRSS 6360. Weed Science Field Trip.** 1 hour. Repeatable for maximum 2 hours credit.

Oasis Title: WEED SCI FLD TRIP.

Prerequisite: CRSS 4340/6340 and CRSS 4340L/6340L.

Four-day field trip to select parts of the Southeast to observe practical aspects of weed science in

the field as related to weed identification, biology, and management.  
Non-traditional format: A four-day field trip in Georgia allowing students to observe how the principles of weed science are applied to solve real world problems.  
Offered summer semester every year.

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**CRSS 7000. Master's Research.** 1-9 hours. Repeatable for maximum 12 hours credit.  
Oasis Title: MASTER'S RESEARCH.  
Prerequisite: Permission of department.  
Research while enrolled for a masters degree under the direction of faculty members.  
Non-traditional format: Independent research under the direction of a faculty member.  
Offered fall, spring, and summer semesters every year.

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**CRSS 7050. Advanced Crop Production.** 3 hours.  
Oasis Title: ADV CROP PROD.  
Prerequisite: [CRSS 3300 and CRSS 4300] or permission of department.  
Effect of environment and heredity on crop production, including light, temperature, water, fertility, and other factors affecting plant growth and management.  
Not offered on a regular basis.

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**CRSS 7300. Master's Thesis.** 1-9 hours. Repeatable for maximum 12 hours credit.  
Oasis Title: MASTER'S THESIS.  
Prerequisite: Permission of department.  
Thesis writing under the direction of the major professor.  
Non-traditional format: Independent research and thesis preparation.  
Offered fall, spring, and summer semesters every year.

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**CRSS 7990. Supervised Teaching Practicum in Crop and Soil Sciences.** 1-3 hours.  
Repeatable for maximum 6 hours credit.  
Oasis Title: TEACH PRACTICUM.  
Prerequisite: Permission of department.  
University-level teaching, including the presentation of lectures and/or laboratory sessions under faculty supervision, at the master's level.  
Non-traditional format: Students lecture in classroom and/or laboratory setting and meet with a faculty supervisor to discuss teaching technique.  
Offered fall and spring semesters every year.

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**CRSS 8000. Soil Physical Chemistry.** 3 hours.  
Oasis Title: SOIL PHYS CHEMISTRY.  
Prerequisite: [CHEM 3100 or (CHEM 2300 and CHEM 2300L)] and [CRSS(FORS) 3060-3060L or GEOL 1250-1250L] or permission of department.  
Physical and surface chemistry applied to soil-water systems. Topics include precipitation-dissolution, redox chemistry, complexation, structure of soil-water interface, adsorption mechanisms, use of computer models to simulate soil chemical reactions, and environmental applications.  
Offered every year.

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**CRSS 8010. Research Methods.** 3 hours.

Oasis Title: RESEARCH METHODS.

Scientific method, thesis and journal article preparation, manuscript review, seminar presentation, grant applications, and computer use related to these topics.

Offered every year.

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**CRSS 8100. Advanced Crop and Soil Science Seminar.** 1 hour. Repeatable for maximum 2 hours credit.

Oasis Title: ADV CSS SEMINAR.

Instruction and practice in oral scientific presentations. A literature search within a general topic area unrelated to degree research, and a formal seminar on the subject, are required.

Offered fall and spring semesters every year.

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**CRSS 8210. Special Problems in Crop and Soil Science.** 1-3 hours. Repeatable for maximum 3 hours credit.

Oasis Title: SPEC PROB CSS.

The planning, completion, and reporting of short-term projects in crop and soil sciences, other than thesis or dissertation, conducted in the laboratory, greenhouse, or field.

Non-traditional format: This course will provide graduate students credit for conducting a research problem under the direction of a faculty member in Crop and Soil Sciences. Credit is variable dependent upon the scope of the research project.

Offered fall, spring, and summer semesters every year.

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**CRSS 8220. Advanced Topics in Crop and Soil Sciences.** 1-3 hours. Repeatable for maximum 12 hours credit.

Oasis Title: ADV TOPICS IN CSS.

Prerequisite: Permission of department.

Advanced topics and methods in Crop and Soil Science, including tropical soil management, application of geographic information systems to crop production, DRIS analysis, advanced analytical methods, microclimatology, crop modeling, and other timely topics.

Offered fall, spring, and summer semesters every year.

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**CRSS 8280-8280L. Crops and Microclimate.** 3 hours. 2 hours lecture and 2 hours lab per week.

Oasis Title: CROPS MICROCLIM.

Prerequisite: P BIO 3830-3830L or permission of department.

Effects of aerial factors (radiation, humidity, temperature, wind, atmospheric gases) on crop growth and productivity are discussed, along with measurement techniques for each. Emphasis is on quantitative analysis of processes occurring at the leaf, whole plant, and canopy levels.

Not offered on a regular basis.

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**CRSS 8330-8330L. Physiology of Herbicide Action.** 2 hours. 1 hour lecture and 2 hours lab per week.

Oasis Title: PHYSIOL HERB ACTION.

Prerequisite: CRSS 4340/6340-4340L/6340L or permission of department.

Herbicide action in crops and weeds, including uptake through roots, penetration through leaves,

and translocation in the plant; mechanism and mode of action of individual herbicides as well as metabolism of xenobiotics in the plant. Laboratory component consists of research techniques used in herbicide physiology research.

Offered spring semester every even-numbered year.

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**CRSS 8340-8340L. Environmental Aspects of Herbicide Use.** 2 hours. 1 hour lecture and 2 hours lab per week.

Oasis Title: ENV ASP HERBICIDE.

Prerequisite: CRSS 4340/6340-4340L/6340L or permission of department.

Behavior of herbicides in soil, water, and air; transfer and transformation processes affecting herbicides. Laboratory introduces research techniques necessary to examine herbicide transfer and transformation.

Offered spring semester every odd-numbered year.

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**CRSS 8350. Weed Ecology.** 2 hours.

Oasis Title: WEED ECOLOGY.

Prerequisite: CRSS 4340/6340-4340L/6340L or permission of department.

Weed succession and development in crops, weed-crop interference, and physiological aspects of weed-crop interactions with an emphasis on modeling.

Offered fall semester every year.

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**CRSS 8520. Advanced Soil Fertility.** 3 hours.

Oasis Title: ADV SOIL FERT.

Prerequisite: (CRSS 4590/6590-4590L/6590L and CHEM 2300 and CHEM 2300L) or permission of department.

Physical, chemical, and biological properties of soil; plant mineral nutrient availability; theory and use of modern soil testing methods. Includes soil, environmental, and management factors that control crop use of applied chemical fertilizers and other sources of plant nutrients.

Offered every year.

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**CRSS 8540-8540L. Soil Mineralogy.** 4 hours. 2 hours lecture and 4 hours lab per week.

Oasis Title: SOIL MINERALOGY.

Prerequisite: CRSS(GEOL) 4540/6540-4540L/6540L or CRSS 4670/6670 or GEOL 4300/6300 or permission of department.

Mineral structure, properties, weathering, formation, and identification as related to soil behavior, distribution, and genesis. Application of laboratory techniques for identification and quantification of minerals in soils and sediments.

Offered every year.

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**CRSS 8600. Advanced Soil Physics: Numerical Method.** 2 hours.

Oasis Title: ADV SOIL PCS NUM.

Prerequisite: Permission of department.

Numerical approach to solving water and solute transport equations. Two-dimensional water and solute movement in unsaturated soils and shallow groundwater are examined by solving the governing partial differential equations using a finite element numerical technique in the model

HYDRUS-2D.

Offered spring semester every year.

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**CRSS 8610. Advanced Soil Physics: Spatial Modeling.** 3 hours.

Oasis Title: ADV SOIL PCS SPT MD.

Prerequisite: [MATH 2210 and MATH 2210L and CRSS 4600/6600-4600L/6600L] or permission of department.

Methods of scaling up water and solute transport predictions from the plot to the field, watershed, and aquifer-loading scale. Methods discussed include stochastic approaches based on the transfer function and deterministic models that interface with geographic information systems.

Offered every year.

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**CRSS(ECOL) 8650. Nutrient Cycling Models.** 3 hours.

Oasis Title: NUTR CYCLING MODELS.

Prerequisite: [CSCI 7010 and CRSS(MIBO) 4610/6610-4610L/6610L] or permission of department.

Structure, function, and performance of current nutrient cycling models used to simulate carbon, nitrogen, phosphorus, and sulfur transformations in the soil.

Offered every year.

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**(CRSS)ECOL 8660-8660L. Soil Biology and Ecology.** 4 hours. 2 hours lecture and 4 hours lab per week.

Oasis Title: SOIL BIOL ECOL.

Not open to students with credit in ECOL(CRSS) 6650-6650L.

Prerequisite: ECOL(BIOL) 3500-3500L or CRSS 4590/6590-4590L/6590L or CRSS(MIBO) 4610/6610-4610L/6610L.

Organisms in the soil environment, with emphasis on macrobiota and their functional roles in food webs and ecosystem processes.

Offered fall semester every even-numbered year.

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**(CRSS)GEOL 8760. Organic Contaminant Hydrogeology.** 3 hours.

Oasis Title: ORG CONT HYDROGEOL.

Prerequisite: (CHEM 2100 and CHEM 2100L) or (CHEM 2212 and CHEM 2212L) or permission of department.

Physical and chemical processes controlling the mobility and fate of organic contaminants in soils, sediments, surface, and ground waters. Processes include biotic and abiotic (hydrolysis, volatilization, sorption, redox, and photochemical) reactions in the natural systems. Relationships between chemical structure and reactivity in the environment.

Offered spring semester every even-numbered year.

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**(CRSS)(ECOL)(FORS)PBIO 8850-8850L. Terrestrial Biogeochemical Cycling.** 4 hours. 2 hours lecture and 4 hours lab per week.

Oasis Title: TERR BIOGECHEM CYCL.

Not open to students with credit in BTNY 8850-8850L.

Prerequisite: ECOL(BIOL) 3500-3500L or STAT 4210 or STAT 4220.

Plant processes which mediate biogeochemical cycling on land. Includes survey of global element cycling, functions of essential elements, element acquisition, translocation and loss by plants, litter decomposition, and methods of estimating standing stocks of elements in and transfer rates of elements between ecosystem components.

Offered spring semester every odd-numbered year.

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**CRSS(PBIO) 8870. Advanced Plant Genetics.** 3 hours.

Oasis Title: ADV PLANT GENETICS.

Not open to students with credit in CRSS(BTNY) 8900 or CRSS(BTNY) 8870.

Prerequisite: PBIO 8100 or permission of department.

The history, and state of the art, in genetic and molecular analysis of complex eukaryotic genomes. We will discuss in detail how genomes can be dissected into manageable parts that can be analyzed by a variety of molecular techniques, to investigate questions in genetics, breeding, and evolution. Special emphasis will be placed upon molecular analysis of quantitative inheritance, genetic mapping by a variety of techniques, physical mapping and map-based cloning, with examples drawn from various genome projects ranging from Arabidopsis to human.

Offered every odd-numbered year.

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**CRSS 8880. Quantitative Aspects of Plant Breeding.** 3 hours.

Oasis Title: QUANT PLANT BRDG.

Prerequisite: [CRSS 4040/6040 and STAT 6220] or permission of department.

Quantitative and population plant genetics and their interrelationship with plant breeding.

Genetic and environmental variation and how they relate to selection procedures and choice of type of variety.

Offered every odd-numbered year.

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**CRSS 8890-8890L. Plant Cytogenetics: Behavior and Evolution of the Plant Genome.** 3 hours. 2 hours lecture and 2 hours lab per week.

Oasis Title: PLANY CYTO GENOME.

Prerequisite: PBIO 8100 or permission of department.

Classical and molecular cytogenetics are integrated to explain the reproductive behavior of angiosperms, the applications of cytogenetics to plant improvement, the study of plant genetics, and the structure and evolution of the plant genome.

Not offered on a regular basis.

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**CRSS 9000. Doctoral Research.** 1-9 hours. Repeatable for maximum 12 hours credit.

Oasis Title: DOCTORAL RESEARCH.

Prerequisite: Permission of department.

Research while enrolled for a doctoral degree under the direction of faculty members.

Non-traditional format: Independent research under the direction of a faculty member.

Offered fall, spring, and summer semesters every year.

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**CRSS 9300. Doctoral Dissertation.** 1-9 hours. Repeatable for maximum 12 hours credit.

Oasis Title: DOCT DISSERTATION.

Prerequisite: Permission of department.

Dissertation writing under the direction of the major professor.  
Non-traditional format: Independent research and preparation of the doctoral dissertation.  
Offered fall, spring, and summer semesters every year.

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**CRSS 9990. Supervised Teaching Practicum in Crop and Soil Sciences. 1-3 hours.**

Repeatable for maximum 6 hours credit.

Oasis Title: TEACH PRACTICUM.

Prerequisite: Permission of department.

University-level teaching, including the presentation of lectures and/or laboratory sessions under faculty supervision, at the doctoral level.

Non-traditional format: Students lecture in a classroom setting and meet with a faculty supervisor to discuss teaching technique.

Offered fall and spring semesters every year.