CROP AND SOIL SCIENCES CSS

Department of Crop and Soil Sciences
College of Agriculture and Natural Resources

101. Introduction to Crop Science
Fall. 3(2-2)

110. Computer Applications in Agronomy
Fall. 2(1-2)
R: Open only to College of Agriculture and Natural Resources students. Not open to students with credit in CSS 100.
Use of computers in agriculture. Basic computer operating systems. Management and use of storage media. Laboratory experience in word processing, spreadsheet, data bases, programming languages, networking, and software related to agriculture.

201. Forage Crops
Fall. 3(2-2)

210. Fundamentals of Soil and Landscape Science
Fall. 3(2-3)
R: Open only to College of Agriculture and Forestry with credit in CSS 141.

250. Introduction to Turfgrass Management
Fall. 3(2-3)
R: CSS 210 or concurrently.
Turfgrass utilization, identification, establishment and management principles. Responses to various cultural practices.

253. Turfgrass Management Seminar
Fall. 1(2-0)
R: CSS 210 or concurrently.
Presentations by individuals involved in turfgrass and golf course management. Topics include golf course construction and operations, preparation for tournaments, and public relations.

261. Soil Management and Environmental Impact
Spring. 3(2-3)
R: CSS 210.
Management of soil physical and chemical properties for the production of food and fiber. Soil management systems that reduce the environmental impact on soil, water and air resources and maximize crop production potential.

302. Advanced Turf Management
Spring. 3(2-3)
R: CSS 210.
Effect of light, heat, cold, drought, and traffic on turfgrass growth and development. Impact of practices such as mowing, cultivation, and compaction on the growth of grasses.

352. Turfgrass Soil Management
Fall. 3(3-4)
R: CSS 210.

355. Introduction to Plant Genetics
Spring. 3(4-0)
R: Not open to freshmen and sophomores.
Fundamentals of plant genetics with applications to agriculture and natural resources. Temporal approval effective from Spring Semester 1993 through Spring Semester 1996.

362. Management of Turfgrass Pests
Fall. 4(3-2)
R: Open only to College of Agriculture and Forestry.
P: CSS 210, BOT 105, or BOT 301.
Chemical, biological, and cultural methods of managing weeds, diseases, and insect pests of turfgrass. Environmental considerations in pest management.

370. Agricultural Cropping Systems Management
Fall. 3(2-3)
R: Not open to freshmen and sophomores.
Interdisciplinary decision making to select crop and production systems based upon soil productivity, climatic adaptation, environmental impacts, and economic constraints.

380. Crop Physiology
Spring of even-numbered years. 3(2-3)
R: Not open to freshmen and sophomores.
Physiological and metabolic function of plants from a whole plant viewpoint. Environmental effects on crop growth, development, and yield.

402. Principles of Weed Science
Fall. 3(2-3)
R: Not open to freshmen and sophomores.
Weed biology and ecology. Cultural, mechanical, biological, and chemical control practices. Herbicide action, selectivity in plants, and effects on environment.

404. Forest and Agricultural Ecology
Fall. 4(3-2)
R: Open only to College of Agriculture and Forestry.
P: CSS 210, BOT 105, or BOT 143.
Structure and function of ecosystems managed for crop and wood production. Productivity, nutrient cycling, community dynamics as affected by management intensity and natural disturbance. Dynamics of managed versus natural ecosystems.

406. Seed Production and Technology
Fall of odd-numbered years. 3(2-3)
R: Not open to freshmen and sophomores.
Principles and practices of field seed production. Crop improvement, variety release, seed production, seed technology and evaluation involved in producing high quality field crop seed.

426. Biogeochemistry
Summer. 3 credits. Open only at W.K. Kellogg Biological Station.
R: Not open to freshmen and sophomores.
Integration of the principles of ecology, microbiology, geochemistry, and environmental chemistry. Chemical applications of research in aquatic and terrestrial habitats.

430. Soil Fertility and Chemistry
Spring. 3(2-2)
R: Not open to freshmen and sophomores.

440. Soil Biophysics
Fall of even-numbered years. 3(2-3)
R: Not open to freshmen and sophomores.
Plant growth properties and soil physical conditions which influence productivity. Principles and applications of soil texture, structure, mechanical impedance, aeration and water. Root responses to the environment.

441. Plant Breeding and Biotechnology
Spring. 4(3-2)
R: Open only to seniors and graduate students.
P: CSS 250.
Principles, concepts, and techniques of agricultural plant biotechnology. Recombinant DNA technology, plant molecular biology, transformation, cell tissue, and organ culture in relation to plant improvement.

451. Cellular and Molecular Principles and Techniques for Plant Sciences
Spring. 4(3-2)
R: Open only to seniors and graduate students.
P: CSS 250 or ZOL 341.
Principles, concepts, and techniques of agricultural plant biotechnology. Recombinant DNA technology, plant molecular biology, transformation, cell tissue, and organ culture in relation to plant improvement.

455. Pollutants in the Soil Environment
Fall. 3(3-0)
R: Not open to freshmen and sophomores.
Chemical and biological reactions of organic and inorganic pollutants in soils.

461. Statistical Methods for Biologists I
Fall. 3(3-0)
R: Open only to seniors and graduate students.
P: CSS 210, ZOL 241.
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression (prediction). Analysis of counted and measured data to compare several biological groups (contingency tables and analysis of variance).

465. Statistical Methods for Biologists II
Fall. 3(3-0)
R: Open only to seniors and graduate students.
P: CSS 210 or ZOL 241.
Concepts of reducing experimental error: covariation, complete and incomplete block designs, Latin squares, split plots, repeated-measures designs, regression applications, and response surface designs.

470. Soil Resources
Fall. 3(2-3)
R: Not open to freshmen and sophomores.
Evaluation of the properties, genesis, and classification of soil resources to assist in making land-use decisions. Field trips required.
### Descriptions — Crop and Soil Sciences of Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Department</th>
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</thead>
<tbody>
<tr>
<td>801</td>
<td>Physiological Crop Ecology</td>
<td>2(2-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>805</td>
<td>Herbicide Action and Metabolism</td>
<td>3(2-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>819</td>
<td>Advanced Plant Breeding</td>
<td>3(3-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>823</td>
<td>Methods in Genetic Engineering of Plants</td>
<td>3(3-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>825</td>
<td>Clay Mineralogy and Soils Genesis</td>
<td>3(3-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>827</td>
<td>Techniques in Cytogenetics</td>
<td>3(3-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>831</td>
<td>Soil and Plant Resources for Sustained World Food Production</td>
<td>3(3-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>832</td>
<td>Environmental and Natural Resource Law</td>
<td>3(3-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>836</td>
<td>Plant Evolution and the Origin of Crop Species</td>
<td>3(3-0)</td>
<td>P: CSS 101 or CSS 210</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>840</td>
<td>Soil Physics</td>
<td>3(3-0)</td>
<td>P: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<td>841</td>
<td>Soil Microbiology</td>
<td>3(3-0)</td>
<td>P: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<tr>
<td>850</td>
<td>Soil Chemistry</td>
<td>3(3-0)</td>
<td>P: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<td>855</td>
<td>Interfacial Environmental Chemistry</td>
<td>3(3-0)</td>
<td>P: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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<td>863</td>
<td>Mineral-Water Interactions</td>
<td>3(3-0)</td>
<td>P: Open only to graduate students in Crop and Soil Sciences or Biological Sciences</td>
<td>Agriculture and Natural Resources, College of Agriculture and Natural Resources, USDA Agriculture Research Service, or equivalent.</td>
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890. Independent Study
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science. Individual study on field, laboratory, or library research.

891. Current Topics in Ecology and Evolution
Summer. 1 credit. Given only at E.W. Kellogg Biological Station. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Zoology and Botany and Plant Pathology. Administered by Zoology. Presentation and critical evaluation of theoretical and empirical developments by visiting scientists.

892. Plant Breeding and Genetics Seminar
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Horticulture and Forestry. Administered by Horticulture. R: Open only to graduate students in Plant Breeding and Genetics or Genetics. Approval of department. Selected topics in plant breeding.

893. Selected Topics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Zoology and Botany and Plant Pathology. Administered by Zoology. Experience in review, organization, oral presentation, and analysis of research.

894. Master's Thesis Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in Crop and Soil Sciences.

895. Advanced Forest Genetics
Fall of odd-numbered years. 2(1-2) Interdepartmental with Forestry and Horticulture. Administered by Forestry. R: Not open to students with credit in EC 252H. Applications of genetics, plant breeding, and biotechnology to the improvement and preservation of diversity, of tree species.

896. Advanced Soil Physics
Fall of odd-numbered years. 3(2-9)

P: CSS 490. R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science. Modelling major physical transport mechanisms in the soil profile. Aeration, temperature, and solute movement. Water movement and evaporation.

897. Quantitative Genetics in Plant Breeding
Spring of even-numbered years. 3(3-0) Interdepartmental with Forestry and Horticulture.

P: CSS 450, STT 422. Theoretical genetic basis of plant breeding with emphasis on traits exhibiting continuous variation. Classical and contemporary approaches to the study and manipulation of quantitative trait loci.

943. Techniques of Analyzing Unbalanced Research Data
Spring. 4(4-0) Interdepartmental with Animal Science, Forestry, Horticulture, and Fisheries and Wildlife. Administered by Animal Science. P: STT 494. R: Open only to graduate students in the College of Agriculture and Natural Resources. Linear model techniques to analyze research data characterized by missing and unequal number of observations in classes. Simultaneous consideration of multiple factors. Estimable comparisons. Hypothesis testing. Computational strategies. Variance and co-variance components. Breeding values.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in Crop and Soil Sciences.

EARTH SCIENCE
Department of Geological Sciences
College of Natural Science

445. Field Studies in Earth Science
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Approval of department. Field experience and techniques in geological sciences, meteorology, soil science, or oceanology.

446. Laboratory Investigations in Earth Science
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Approval of department. Laboratory techniques and investigations in geological sciences, meteorology, soil science, or oceanology.

800. Special Problems in Earth Science
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Approval of department. Individual faculty directed study on topics in earth science.

ECONOMICS
Department of Economics
The Eli Broad College of Business and The Eli Broad Graduate School of Management

201. Introduction to Microeconomics
Fall, Spring, Summer. 3(3-0) R: Not open to students with credit in EC 251H. Economic institutions, reasoning and analysis. Consumer, production, determination of price and quantity in different markets. Income distribution, market structure and normative analysis.

202. Introduction to Macroeconomics
Fall, Spring, Summer. 3(3-0) R: Not open to students with credit in EC 252H. Determinant of Gross National Product, unemployment, inflation and economic growth. National income accounting and fiscal policy. Aggregate demand, supply management and monetary policy.

251H. Microeconomics and Public Policy
Fall, Spring, 4(4-0) R: Not open to students with credit in EC 201. Theories of consumer behavior, production and cost. Output and price determination in competition and monopoly. Welfare economics, general equilibrium, externalities, and public goods.

252H. Macroeconomics and Public Policy
Fall, Spring, 3(3-0) P: EC 251H or EC 201, EC 301. R: Not open to students with credit in EC 202. Theory of national income, unemployment, inflation and economic growth and its application to economic analysis and policy.

301. Intermediate Microeconomics
Fall, Spring, Summer. 3(3-0) P: EC 201, EC 202. R: Not open to students with credit in EC 251H. Theories of consumer choice, production, cost, perfect competition, and monopoly. Welfare economics, general equilibrium, externalities and public goods.

302. Intermediate Macroeconomics
Fall, Spring, Summer. 3(3-0) P: EC 201, EC 202. R: Not open to students with credit in EC 252H. National income accounting. Determination of aggregate output, employment, price level, and inflation rate. Policy implications.

360. Comparative Economic Systems
Fall, Spring, Summer. 3(3-0) P: EC 201 or EC 251H; or EC 202 or EC 252H. Characteristic functions of economic systems. Alternative patterns of economic control, planning, and market structure. Theories, philosophies, and experiences associated with capitalism, socialism, and mixed economies.