

901. Seminar in Contemporary Criminal Justice Theory
Fall. 3(3-0)

R: Open only to graduate students in Criminal Justice or in Social Science-Criminal Justice. Theoretical perspectives and issues in criminal justice and criminology
QA: C J 990

902. Seminar in Criminal Justice Systems
Spring of odd-numbered years. 3(3-0)

R: Open only to graduate students in Criminal Justice or in Social Science-Criminal Justice. Contemporary issues in the criminal justice system.
QA: C J 930

903. Research Utilization in Criminal Justice
Spring of even-numbered years. 3(3-0)

R: Open only to graduate students in Criminal Justice or in Social Science-Criminal Justice. Research application in criminal justice theory and practice.
QA: C J 992

310. Soil Management and Environmental Impact
Spring. 3(2-3)

P: 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.
QP: CSS 210 QA: CSS 390

332. Advanced Turf Management
Spring. 3(3-0)

P: CSS 232.
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.
QP: CSS 318 QA: CSS 416

342. Turfgrass Soil Management
Fall. 3(3-0)

P: CSS 210.
Fertility and pH control of turf soils. Drainage, irrigation programming, cultivation, topdressing, and soil amendments. Environmental impacts. Specialized soils.
QP: CSS 318 QA: CSS 414

350. Introduction to Plant Genetics
Spring. 3(4-0)

P: BOT 105 or BS 111. R: Not open to freshmen and sophomores.
Fundamentals of plant genetics with applications to agriculture and natural resources.
Temporary approval effective from Spring Semester 1993 through Spring Semester 1995.
QP: BOT 205, BS 211 QA: CSS 350

362. Management of Turfgrass Pests
Fall. 4(3-2) Interdepartmental with Botany and Plant Pathology, and Entomology.

P: CSS 232.
Chemical, biological, and cultural methods of managing weeds, diseases, and insect pests of turfgrass. Environmental considerations in pest management.
QP: CSS 318 QA: CSS 419

370. Agricultural Cropping Systems Management
Fall. 3(2-3)

P: CSS 101 or CSS 210; MTH 110 or MTH 116. 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.
QP: CSS 101 or CSS 210, MTH 108

380. Crop Physiology
Spring of odd-numbered years. 3(2-3)

P: CSS 101; BOT 105 or BOT 301. 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.
QP: CSS 101, BOT 301 QA: CSS 380

402. Principles of Weed Science
Fall. 3(2-2)

P: BOT 105, CEM 143. 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.
QP: CEM 143, BOT 301 QA: CSS 402

406. Seed Production and Technology
Fall of even-numbered years. 3(2-2)

P: CSS 101, CSS 350. 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.
QP: CSS 101, CSS 350 QA: CSS 406, CSS 485

430. Soil Fertility and Chemistry
Spring. 3(2-2)

P: CSS 210. R: Not open to freshmen and sophomores.
Application of chemistry to diagnosing and improving soil fertility. Soil amendments including macro- and micro-nutrients. Reducing environmental degradation.
QP: CSS 210 QA: CSS 430

440. Soil Biophysics
Fall of even-numbered years. 3(2-2)

P: CSS 210. 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.
QP: CSS 210 QA: CSS 440

441. Plant Breeding and Biotechnology
Spring. 4(3-2) Interdepartmental with Horticulture and Forestry.

P: CSS 350.
Plant improvement by genetic manipulation. Genetic variability in plants. Traditional and biotechnological means of creating and disseminating recombinant genotypes and cultivars.
QP: CSS 350 QA: CSS 408

451. Cellular and Molecular Principles and Techniques for Plant Sciences
Spring. 4(2-6) Interdepartmental with Forestry and Horticulture.

P: CSS 350 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.
QP: CSS 350 or ZOL 441 QA: CSS 451, HRT 838

455. Pollutants in the Soil Environment
Fall. 3(3-0)

P: CEM 143. R: Open only to seniors and graduate students.
Chemical and biological reactions of organic and inorganic pollutants in soils.
QP: CEM 143 QA: CSS 455

470. Soil Resources
Fall. 3(2-3)

P: CSS 210. 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.
QP: CSS 210 QA: CSS 470

490. Independent Study

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
P: CSS 101 or CSS 210. R: Approval of department; application required.
Individual work on field, laboratory, or library research problem of special interest to the student.
QP: CSS 101 or CSS 210 QA: CSS 411

491. Special Topics

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course.
P: CSS 101 or CSS 210.
Topics from crop production, crop physiology, turfgrass management, organic soils, turfgrass soils, soil fertility, plant and soil relationships, genetics, biotechnology, environmental science, or sustainable agriculture.
QP: CSS 101 or CSS 210 QA: CSS 412

492. Seminar

Fall. 1(1-0)
P: CSS 210; CSS 342 or CSS 370.
Synthesis, integration and application of agronomic principles to current issues in agronomy via discussion and oral and written communication.
QP: CSS 210, CSS 370 or CSS 342 QA: CSS 420

801. Physiological Crop Ecology

Fall of even-numbered years. 2(2-0)
Environmental factors that limit crop distribution and productivity. Physiological basis for stress injury, resistance to temperature extremes, flooding, drought, and salinity.
QA: CSS 801

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)
Principles of crop management, improvement, and fertilization. International and sustainable agriculture. Water quality issues.
QA: CSS 101

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 CPS 100.
Use of computers in agriculture. Basic computer operating systems. Management and use of storage media. Laboratory experience in word processing, spread sheets, data bases, programming languages, networking, and software related to agriculture.

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

Forage crop production, management, and utilization. Crop identification. Soil fertilization. Planting and harvesting of grasses and legumes.
QA: CSS 301

210. Fundamentals of Soil and Landscape Science
Fall. 3(2-3) Interdepartmental with Forestry.

P: CEM 141.
Agricultural and natural resource ecosystems: soil, vegetation and ground water components. Energy, water and nutrient cycles. Soil classification and mapping. Land management and use issues.
QA: CSS 210

232. Introduction to Turfgrass Management
Fall. 3(2-2)

P: CSS 110; CSS 210 or concurrently.
Turfgrass utilization, identification, establishment and management principles. Responses to various cultural practices.
QP: CSS 210 QA: CSS 318

262. Turfgrass Management Seminar
Fall. 1(2-0)

P: CSS 232 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.
QP: CSS 318 QA: CSS 417

**Descriptions—Crop and Soil Sciences
of
Courses**

805. Herbicide Action and Metabolism
Spring of even-numbered years. 2(2-0)
Properties and characteristics of herbicides. Processes involved in herbicide action, transport, and fate in plants and soils.
QA: CSS 805

823. Methods in Genetic Engineering of Plants
Fall of even-numbered years. 4(0-8) Interdepartmental with Horticulture and Forestry. Bacterial transformation. Plant transformation via Ti-plasmid, protoplast/PEG, and electroporation methods. Detection of foreign gene integration and expression.

825. Clay Mineralogy and Soils Genesis
Spring of odd-numbered years. 4(3-2) Interdepartmental with Geological Sciences.
R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science.
Mineral structures. X-ray diffraction, pedogenic processes, and mineral transformations and stability.
QP: CSS 850, CSS 840, CSS 470 QA: CSS 825, CSS 870

827. Techniques in Cytogenetics
Fall of odd-numbered years. 1(0-3) Interdepartmental with Horticulture and Forestry. Preparation of chromosomes from commercially important plants for cytogenetic analysis.

831. Soil and Plant Resources for Sustained World Food Production
Spring of even-numbered years. 3(3-0)
World food production capacities related to soil and climatic resources. Management and utilization of genetic resources for sustained production of human foods and animal feeds.
QA: CSS 831, CSS 480

840. Soil Physics
Fall of even-numbered years. 3(2-3)
R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science.
Physical properties of soil including texture, structure, consistency, aeration, moisture content, and temperature. Quantitative measurement of plant growth. Agronomic and engineering practices.
QA: CSS 840

850. Soil Chemistry
Spring. 3(3-3)
R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science.
Ion activities, ionic exchange and equilibrium reactions. Soil pH, macro- and micronutrients, saline soils and availability of nutrients to plants.
QP: CEM 383 QA: CSS 850

853. Plant Mineral Nutrition
Fall of odd-numbered years. 3(3-0) Interdepartmental with Horticulture.
P: BOT 301.
Inorganic ion transport in plant cells and tissues. Physiological responses and adaptation to problem soils. Genetic diversity in nutrient uptake and use by plants. Physiological roles of elemental nutrients in crop growth.
QP: BOT 301 QA: CSS 853

855. Interfacial Environmental Chemistry
Fall of even-numbered years. 4(4-0)
R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science.
Principles and mechanisms of reactions at solid-liquid interfaces emphasizing environmental chemistry. Sorption of ionic and organic compounds. Properties of colloids. Kinetics of surface reactions.
QA: CSS 812

865. Organic Chemistry of Soils
Spring of even-numbered years. 2(2-0)
Chemistry of natural and anthropogenic organic substances in soils.
QA: CSS 865

890. Independent Study
Fall, Spring, Summer. 1 to 6 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.
QA: CSS 811

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.
R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, or College of Natural Science.
Selected topics in crop and soil sciences of current interest and importance.
QA: CSS 812

899. 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.
QA: CSS 899

940. Advanced Soil Physics
Fall of odd-numbered years. 2(2-0)
P: CSS 840. 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.
QP: CSS 840 QA: CSS 812

941. Quantitative Genetics in Plant Breeding
Spring of odd-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.
QA: CSS 941

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.
QA: CSS 999

EARTH SCIENCE ES

**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.
QA: ES 445

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.
P: ES 445 or concurrently. R: Approval of department.
Laboratory techniques and investigations in geological sciences, meteorology, soil science, or oceanology.
QP: ES 445 QA: ES 446

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.
QA: ES 800

ECONOMICS EC

**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. Consumption, production, determination of price and quantity in different markets. Income distribution, market structure and normative analysis.
QA: EC 201

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

251H. Microeconomics and Public Policy
Fall, Spring. 4(4-0)
R: Open only to Honors College students. Not open to students with credit in EC 301.
Theories of consumer behavior, production and cost. Output and price determination in competition and monopolies. Welfare economics, general equilibrium, externalities, and public goods.
QA: EC 251H, EC 324

252H. Macroeconomics and Public Policy
Fall, Spring. 3(3-0)
P: EC 251H; or EC 201, EC 301. R: Open only to Honors College students. Not open to students with credit in EC 302.
Theory of national income, unemployment, inflation and economic growth and its application to economic analysis and policy.
QA: EC 252H or EC 326

301. Intermediate Microeconomics
Fall, Spring, Summer. 3(3-0)
P: EC 201, EC 202. 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.
QP: EC 201, EC 202 QA: EC 324

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.
QP: EC 201, EC 202 QA: EC 326

306. Comparative Economic Systems
Fall. 3(3-0)
P: EC 201 or EC 251H; EC 202 or EC 252H.
Characteristics and functions of economic systems. Alternative patterns of economic control, planning, and market structure. Theories, philosophies, and experiences associated with capitalism, socialism, and mixed economies.
QP: EC 201 or EC 251H, EC 202 or EC 252H QA: EC 434