992. Research Utilization and Application in Criminal Justice
Spring. 3(3-0) Majors or approval of school.
Substantive and administrative problems of conducting research and existing attempts to solve these. Utilization of research in bringing about change in the criminal justice system. Methods of maximizing research utility.

CROP AND SOIL SCIENCES
CSS

College of Agriculture and Natural Resources

101. Crop Science
Fall. 3(3-0)
Principles of identification, adaptation, management, and utilization of field crops for food and fiber. Fundamentals of crop management, breeding, weed control, crop quality, and tropical crops in world agriculture.

202. Soils and Man’s Environment
Winter. 3(3-0) Interdepartmental with the departments of Fisheries and Wildlife and Resource Development, and Natural Resources. Use of soil-water resources in a technological society as it relates to environmental quality. Nature of pollution problems and their possible solutions. Food production and world population.

210. Fundamentals of Soil Science
Fall. Winter. 5 credits.
Principles of the origin and development of soils. Relationship of properties to utilization and soil fertility to plant composition and animal health. Emphasis is placed on changing soils to serve man.

230. Plant and Animal Genetics
Winter. 5(5-0) B $ 211.
Fundamentals of modern genetics with particular focus on problems and application in agriculture and natural resources.

301. Forage Crops
Fall. 3(2-2) Sophomores.
Distribution, morphology, identification, physiology, management and utilization of forage crops for hay, silage, and pasture for livestock and for soil improvement and conservation.

331. Soil Management
Winter. 4(4-0) CSS 210.
Management of soils, drainage, and irrigation, organic matter, tillage, rotation, conservation practices, soil reaction, lime, fertilizers, and microminerals. Soil management vs. soil conservation. Special study in general crops, horticultural crops, greenhouse crops, turf, and organic soils.

380. Ecology and Physiology of Agricultural Plants
Spring. 3(3-0) FOR 220 or BOT 301.
Interrelationships of physiological processes and environmental manipulation for higher yield of agricultural plants.

390. Soil Conservation and Land Use
Winter. 3(3-0) CSS 210.
Concepts of soil erosion by water and wind and methods for soil conservation including control of erosion and sedimentation. Interpretation of soil properties for land use decisions.

402. Principles of Weed Control in Field Crops
Fall. 4(3-2) CEM 133, BOT 301.
Principles underlying weed control practices for agronomic crops. Factors involved in mechanical, chemical and biological control and basic physiological aspects of herbicide applications.

405. Crop Improvement and Seed Production
Winter. 4(3-2) CSS 250, Interdepartmental with the Department of Horticulture.
Application of genetics and other sciences to breeding and improvement of agronomic and horticultural crops.

408. Principles of Plant Breeding
Winter. 4(3-2) CSS 250. Interdepartmental with the Department of Horticulture.
Application of genetics and other sciences to breeding and improvement of agronomic and horticultural crops.

411. Special Problems in Agronomy
Fall. Winter. Spring. 3(3-0) or 4(3-0) May reenroll for a maximum of 6 credits if different topics are taken. Approval of department.
Special crop problems in production, physiology, ecology, weed control, turfgrass management, storage, preservation and seed studies. Special soils problems in fertility, geography, classification, conservation, management, organic soils and turfgrass soils.

412. Topics in Agronomy
Fall. Winter. Spring. 2(2-0) or 3(3-0) May reenroll for a maximum of 9 credits if different topics are taken. Approval of department.
Topics will be selected from crop production, crop physiology, turfgrass management, organic soils, turfgrass soils, soil fertility and genetic analysis.

415. Turfgrass Management
Spring. 3(2-2)
Adaptation characteristics and utilization of turf grasses, management principles and physiological bases for the establishment and maintenance of turf for lawns, athletic fields, golf courses, cemeteries, parks, highways and airfields.

420. Seminar
Winter. 1(1-0) May reenroll for a maximum of 4 credits.

424. Forest Soils
Spring. 4(3-2) CSS 210; FOR 220 or FOR 204. Interdepartmental with and administered by the Department of Forestry.
Interrelationships of forest site and the growth of forests. Classification and productivity of forest soils. Effects of silvicultural and forest management practices on the soil. Two-day field trip required.

430. Soil Fertility and Fertilizers
Spring. 3(4-1) CSS 210.
Assessment of the status of soils and alteration of fertility by the use of fertilizers, lime, manure, and cropping systems. The role of colchicine in ion fixation and exchange. Soil and tissue tests. The history, technology, and use of fertilizers.

440. Soil Biophysics
Winter. 3(3-0) CSS 210 and BOT 301; CSS 380 recommended.

442. Soil Microbiology
Spring. 3(3-0) MPH 200 or MPH 301. Interdepartmental with and administered by the Department of Microbiology and Public Health.
Nature of microorganisms in soils are studied with emphasis on ecological, biochemical, and physical aspects.

470. Soil Classification
Fall. Spring. Summer of odd-numbered years. 4(0-3) CSS 210 or approval of department.
Determination of soil properties by field examination of soils. Classification of soils. Preparation of land use report based upon soil maps of assigned areas. Field trip required.

480. Soil Geography and Land Use of North America
Spring. 3(2-1) CSS 210 or approval of department.
Properties, geography and dominant land use of the major soils of North America.

485. Seed Science
Spring. 3(3-2) Approval of department.
Morphological and physiological changes during seed formation, development, maturation and germination. Practical and biological aspects of seed drying, storage, deterioration, dormancy and quality. Current problems and research in seed science.

1DC. The Impact of Animal Resource Management Upon the World’s Developing Nations
For course description, see Interdisciplinary Courses.

801. Crop Ecology
Fall of even-numbered years. 3(3-0) Approval of department.
Environment within the crop community and the environmental stresses limiting crop survival. Temperature, light, water and atmospheric stresses and variations in the crop canopy will be discussed.

803. Crop Physiology
Spring of even-numbered years. 3(3-0) Approval of department.
Role of physiological factors determining maximum crop yield and quality.

805. Herbicidal Action and Metabolism
Spring of odd-numbered years. 3(3-0) CSS 402; BOT 415 or concurrently.
A study of the properties and characteristics of herbicides, the fundamental processes involved in the physiological action, behavior, and metabolism of herbicides.
511. **Advanced Problems**  
(810.) Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 6 credits if different problem is taken. Approval of department.  
Field crop problems in management, physiology, ecology, breeding, turfgrass culture, weed control, nutritional quality, tropical crops, crop extension and seed studies. Soils problems in biophysical chemistry, classification, conservation, fertility, geography, management microbiology, biochemistry, micronutrients, micrometeorology, mineralogy, organic soils and physics.

512. **Selected Topics**  
Fall, Winter, Spring, Summer. 2(2-0) or 3(3-0) May reenroll for a maximum of 8 credits if different topics are taken. Approval of department.  
Topics will be selected from physiology of herbicides, micronutrients, advanced soil physics, advanced soil chemistry.

520. **Seminar**  
Winter, Spring. 1(1-0) May reenroll for a maximum of 3 credits. Studies and presentation of research in crop and soil sciences.

525. **Clay Mineralogy**  
Winter. 4(3-4) CSS 840, CSS 850 or approval of department. Interdepartmental with and administered by the Department of Geology.  
Structures and properties of clays; their origins, occurrence, and utilization. Methods of studying clays including x-ray diffraction, differential thermal analysis, infrared absorption and other chemical and physical techniques.

530. **Physiological Genetics**  
Winter. 3(3-0) Approval of department. Interdepartmental with and administered by the Department of Forestry.  
Physiological bases for genetic variation in higher plants including adaptive physiology, quantitative genetics, growth correlations, biochemical genetics, hybrid physiology, and genealogy.

531. **World Food Crops**  
Spring of odd-numbered years. 3(3-0) 
World food crop production and related systems of agriculture which provide this resource. The impact of modern discoveries and opportunities for change.

533. **Soil Fertility and Plant Nutrition**  
(830, 831.) Winter. 3(3-0) CSS 430 or approval of department.  
Fundamental concepts in soil fertility and mineral nutrition of plants; fate of nutrients applied to soils, nutrient uptake, translocation and utilization by plants; principles of laboratory, greenhouse and field research methods.

540. **Soil Physics**  
Fall. 5(3-6) CSS 430, CEM 162 or approval of department.  
Physical properties of soil (texture, structure, consistency, aeration, water, temperature, etc.), their measurement, and relation to plant growth, and agronomic and engineering practices.

550. **Soil Chemistry**  
Winter. 5(3-6) CSS 430, CEM 162, CEM 383; or approval of department.  
Chemistry of mineral weathering and soil formation, ionic activities, ionic exchange and equilibrium reactions, soil pH, specific elements and their chemical analysis, and availability of nutrients to plants.

551. **Developmental Genetics and Plant Breeding**  
Fall of odd-numbered years. 4(3-1) One course each in genetics, statistics and plant breeding.  
Plant breeding in relation to genetics of growth and development. Problem sets in statistical treatment of plant breeding data.

560. **Soil Biochemistry**  
Spring of even-numbered years. 4 credits. CSS 850; MPH 442.  
Biochemical transformations of mineral nutrients and natural and exotic organic materials in soils, considered in relation to chemical, physical and ecological systems in the complex soil environment.

570. **Origin and Classification of Soils**  
Winter. 4(3-2) CSS 470, CSS 840, or approval of department.  

599. **Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

620. **Design and Analysis of Agronomic Experiments**  
Spring. 3(3-0) STT 423 or approval of department.  
Constructing and analyzing designs for experimental investigations in the biological sciences.

651. **Cytogenetics in Plant Breeding**  
Winter of odd-numbered years. 3(3-0) BOT 427, BOT 828, or approval of department. Interdepartmental with the Department of Horticulture.  
Application of cytogenetic principles to plant breeding. Significance of recombination, role of induced mutations, polyploid, chromosome substitution, and aneuploid analyses as they apply to the field of plant breeding.

652. **Plant Breeding Biometrics**  
Winter of even-numbered years. 4(3-2) Approval of department.  
Biometrical genetics as it applies to plant breeding. Includes studies of path coefficients, partitioning of variance, and the principles of selection in a changing environment.

999. **Research**  
Fall, Winter, Spring, Summer. Variable credit.