

899. Thesis Research
Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 6 credits. Majors or approval of school. Planned research and writing directed by student's thesis committee.

930. Seminar on Criminal Justice Systems
Winter. 3(3-0) Graduate students. Topical issues on the development, functioning, and interrelationships of components of criminal justice systems and how systemic coherence can be achieved within a democratic society.

990. Readings in Criminal Justice and Criminology
Fall. 3 to 5 credits. Graduate students. Topical reading of major research contributions to criminology and criminal justice. Consideration of applicability of criminological research to functioning of the criminal justice system.

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.

250. Plant and Animal Genetics
Winter. 5(5-0) B S 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) 210. Management of soils, drainage and irrigation, organic matter, tillage, rotation, conservation practices, soil reaction, lime, fertilizers, and micronutrients. 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) 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
Fall. 3(2-2) Juniors. Interdepartmental and administered jointly with the Horticulture Department. Comprehensive study of principles underlying weed control practices, and factors involved in both mechanical and chemical control.

406. Crop Improvement and Seed Production
Winter. 4(3-2) Practical methods of crop improvement, seed production, storing, cleaning, packing, and distribution, seed certification of small grains, legumes, corn, beans, potatoes, visits to seed agencies and seed farms.

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

411. Special Problems in Agronomy
(407.) Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 6 credits if different problem is taken. 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, Summer. 2(2-0) or 3(3-0) May re-enroll for a maximum of 9 credits of different topics are taken. Approval of department. Topics will be selected from crop production, crop physiology, turfgrass management, organic soils, turfgrass soils and soil fertility.

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 air-fields.

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

424. Forest Soils
Spring. 4(3-3) CSS 210; FOR 220 or 304. 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. 5(4-1) 210. Assessment of the fertility of soils and alteration of fertility by the use of fertilizers, lime, manure, and cropping systems. The role of colloids in ion fixation and exchange. Soil and tissue tests. The history, technology, and use of fertilizers.

440. Soil Biophysics
Winter. 3(3-0) 210 and BOT 301; CSS 380 recommended. Salient features of soil physical and biological properties related to plant growth, principles and applications. Emphasis on root responses to the environment. Bioenergetics of the root-soil interface.

442. Soil Microbiology
Spring. 3(3-0) MPH 200 or 301 or 401. Interdepartmental with and administered by the Department of Microbiology and Public Health. Major groups of microorganisms of importance in soils are studied with emphasis on ecological, biochemical, and physical aspects.

470. Soil Classification
Fall, Spring, Summer of odd-numbered years. 4(0-8) 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 trips required.

480. Soil Geography and Land Use of North America
Spring. 3(2-1) 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.

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

IDC. 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 yields and quality.

805. Herbicidal Action and Metabolism

Spring of odd-numbered years. 3(3-0)
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.

811. Advanced Problems

(810.) Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll 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 biophysics, chemistry, classification, conservation, fertility, geography, management microbiology, biochemistry, micronutrients, micropedology, mineralogy, organic soils and physics.

812. Selected Topics

Fall, Winter, Spring, Summer. 2(2-0) or 3(3-0) May re-enroll for a maximum of 9 credits if different topics are taken. Approval of department.

Topics will be selected from physiology of herbicides, micronutrients, advanced soil physics, advanced soil chemistry.

820. Seminar

Winter, Spring. 1(1-0) May re-enroll for a maximum of 3 credits.

Studies and presentation of research in crop and soil sciences.

825. Clay Mineralogy

Winter. 4(3-4) 840, 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.

830. Physiological Genetics

Winter. 3(3-0) Approval of department. Interdepartmental with and administered by the Forestry Department.

Physiological bases for genetic variation in higher plants including adaptive physiology, quantitative genetics, growth correlations, biochemical genetics, hybrid physiology, and geneology.

831. 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.

833. Soil Fertility and Plant Nutrition (SLS 830, 930.) Winter. 3(3-0)

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.

840. Soil Physics

Fall. 5(3-6) 430; CEM 162 or approval of department.

Physical properties of soil (texture, structure, consistency, aeration, water, temperature, etc.), their quantitative measurement, and relation to plant growth, and agronomic and engineering practices.

850. Soil Chemistry

Winter. 5(3-6) 430; CEM 162, 383; or approval of department.

Chemistry of mineral weathering and soil formation, ion activities, ionic exchange and equilibrium reactions, soil pH, specific elements and their chemical analysis, and availability of nutrients to plants.

851. 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.

860. Soil Biochemistry

Spring of even-numbered years. 4 credits. 850; MPH 442.

Biochemical transformations of mineral nutrients and of natural and exotic organic materials in soils, considered in relation to chemical, physical and ecological systems in the complex soil environment.

870. Origin and Classification of Soils

Winter. 4(3-2) 470, 840, or approval of department.

Genesis, morphology and classification of major soils of the world. Relationships among soils in natural and cultural landscapes. How soil properties affect their use, management and conservation. Land classifications for various purposes.

899. Research

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

920. 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.

951. Cytogenetics in Plant Breeding

Winter of odd-numbered years. 3(3-0)
BOT 427, 828, or approval of department. Interdepartmental with the Horticulture Department.

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.

952. 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.

DAIRY SCIENCE

DRY

College of Agriculture and Natural Resources

214. Dairy Production

Fall, Spring. 4(3-2)

Dairy cattle in modern agriculture. Normal cow behavior. Feeding, breeding and management of herd. Commercial milk production and marketing milk.

314. Dairy Herdsman Techniques

Winter. 2(0-4) 214, majors only.

Herd health and management procedures, disease prevention and detection, equipment maintenance and record systems for dairy herds.

323. Dairy Cattle Judging

Spring. 3(0-6)

Desired type in dairy cattle. Judging and show ring procedures. Competitive judging. Teams selected to represent Michigan State University in national competition.

371. Dairy Seminar

Spring. 1(1-0) Juniors.

Major issues pertinent to the dairy industry are described by authorities from MSU and the dairy industry of Michigan. Students are provided an opportunity for an exchange in ideas.

413. Dairy Farm Management

Spring. 3(2-2)

Analysis of dairy farm organization and operations. Dairy herd management practices. Dairy cattle housing with emphasis on economical and efficient usage. Use of dairy records in the farm operation.

424. Dairy Cattle Breeding

Spring. 4(2-4) ANS 461.

Applications of population genetics to improving dairy cattle. Use of selection, aids to selection, and systems of mating to formulate breeding plans. Inheritance of economic traits. Breed improvement programs.