

902 Seminar in Criminal Justice Systems
 Spring of even 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.

903 Research Utilization in Criminal Justice
 Spring of odd 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.

904 Criminal Justice Organizations and Processes
 Spring. 3(3-0) R: Open only to graduate students in Criminal Justice.
 Theoretical perspectives on organizations and processes in criminal justice. Evaluation of organizational performance in justice agencies.

905 Law and Society
 Fall. 3(3-0) R: Open only to graduate students in Criminal Justice.
 Theoretical perspectives on law. Impact of law on society and the criminal justice system.

906 Advanced Quantitative Methods in Criminal Justice Research
 Fall. 3(3-0) RB: (CJ 887 and STT 421) or introductory statistics course. R: Open only to graduate students in Criminal Justice.
 Applications of quantitative techniques to criminal justice data. Use of multiple regression and SPSS.

907 Advanced Topics in Criminal Justice Data Analysis
 Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:M: (CJ 906) R: Open only to graduate students in Criminal Justice.
 Advanced quantitative analysis techniques for criminal justice data.

908 Advanced Topics in Criminal Justice
 Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to graduate students in Criminal Justice.
 Intensive study of one subfield of criminal justice. Critical evaluation of the literature.

999 Doctoral Dissertation Research
 Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 50 credits in all enrollments for this course. R: Open only to doctoral students in Criminal Justice.
 Doctoral dissertation research.

110 Computer Applications in Agronomy
 Fall. 2(1-2) R: Open only to students in the College of Agriculture and Natural Resources. Not open to students with credit in CSE 101.
 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.

151 Seed and Grain Quality
 Spring. 2(2-2) SA: CSS 051
 Principles and practices of producing, conditioning, testing and marketing field crop seed. Grain grading and quality evaluation. Offered first ten weeks of semester.

156 Weed Management
 Fall of odd years. 3(2-2) R: Open only to freshmen or sophomores. Not open to students in Crop and Soil Sciences.
 Cultural, mechanical, biological, and chemical weed management practices in agronomic crops.

164 Golf Course Design and Construction Techniques
 Fall. 2(2-0) RB: (CSS 210 and CSS 232)
 Concepts and theory of golf course design and construction including location, space, topography, clientele, and environmental concerns.

171 Operations Budgeting for Golf Course Managers
 Spring. 2(3-0) RB: (CSS 232 and CSS 210)
 Not open to students with credit in CSS 071.
 Budgeting. Financial analysis. Purchasing and materials management for golf course operations. Offered first ten weeks of semester.

178 Golf Turf Irrigation
 Spring. 2(2-2) Not open to students with credit in CSS 078.
 Golf course irrigation systems: installation and maintenance including water management. Offered first ten weeks of semester.

181 Pesticide and Fertilizer Application Technology
 Spring. 3(3-3) SA: CSS 081
 Effective and efficient application of pesticides and fertilizers to turf and ornamentals. Pesticide handling, legal, and environmental concerns. Calibration of equipment. Offered first ten weeks of semester.

192 Professional Development Seminar I
 Spring. 1(0-2) R: Open only to students in the Department of Crop and Soil Sciences.
 Career development, critical issues analysis, resume writing, scientific presentations and public speaking in crop and soil sciences.

201 Forage Crops
 Fall. 3(2-2)
 Forage crop production, management, and utilization. Crop identification. Soil fertilization. Planting and harvesting of grasses and legumes.

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

211 Turfgrass and the Environment
 Spring. 2(3-0) P:M: (CSS 232) RB: (CSS 210)
 Pesticide and nutrient fate, site assessment, fuel use, equipment washing systems and criteria for recognizing sensitive sites. Conservation and best management practices to maximize protection of natural resources. Offered first ten weeks of semester.

212 Advanced Crop Production
 Fall. 2(2-0) P:M: (CSS 100 or CSS 101) RB: (CSS 210 and CSS 110)
 Systems approach to production of field crops including corn, soybeans, small grains, sugar beets, and dry beans.

222 New Horizons in Biotechnology
 Fall. 2(2-0) Interdepartmental with Entomology.
 Perspectives on biotechnology for safer food production, environmental quality, and improved human health. Impacts of biotechnology on the national economy. Political and ethical ramifications of applied biotechnology.

232 Introduction to Turfgrass Management
 Fall. 3(2-2) P:M: (CSS 210 or concurrently) RB: (CSS 110 or CSE 101)
 Turfgrass utilization, identification, establishment and management principles. Responses to various cultural practices.

242 Athletic Field Maintenance and Construction
 Fall. 2(2-0) P:M: (CSS 232 or concurrently and CSS 210 or concurrently)
 Maintenance, renovation, and construction of athletic fields with emphasis on baseball and football. Soil testing, cultivar selection, and surveying. Safety and liability concerns. Field trips required.

262 Turfgrass Management Seminar
 Fall. 1(2-0) A student may earn a maximum of 2 credits in all enrollments for this course. P:M: (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.

267 Turfgrass Practices
 Spring. 2(2-2) P:M: (CSS 232) SA: CSS 067
 Turfgrass establishment, renovation, and construction principles. Maintenance of golf course turf. Agronomic and management principles applied to golf course maintenance.

269 Turfgrass Strategies
 Spring. 2(3-0) P:M: (CSS 232)
 Issues in turfgrass management including employee relations, construction, and environmental problems. Offered first ten weeks of semester.

272 Turfgrass Soil Management
 Fall. 3(2-2) RB: (CSS 043 or CSS 210) Not open to students with credit in CSS 044 or CSS 342.
 Impact of fertilization programs on turfgrasses and the environment. Irrigation, drainage, cultivation, top dressing, amendments and pH control of turfgrass soils.

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 production including crop and soil management and improvement. International and sustainable agriculture. Water quality issues.

Crop and Soil Sciences—CSS

- 290 Independent Study in Crop and Soil Science**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the Institute of Agricultural Technology. SA: CSS 057 Not open to students with credit in CSS 057.
Field, laboratory, or library research problems.
- 292 Management of Turfgrass Weeds**
Spring. 2(2-2) P:M: (CSS 232) RB: (BOT 105)
Chemical, biological, and cultural methods of managing turfgrass weeds. Environmental considerations in weed management.
- 310 Soil Management and Environmental Impact**
Spring. 3(3-0) P:M: (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.
- 350 Introduction to Plant Genetics**
Spring. 3(4-0) P:M: (BOT 105 or BS 111) R: Not open to freshmen or sophomores.
Fundamentals of plant genetics with applications to agriculture and natural resources.
- 355 Environmental Soil Chemistry**
Fall. 3(2-2) P:M: (CEM 143 and CSS 210)
Soil chemistry concepts as they apply to major chemical groups of environmental importance including metals, nitrogen, phosphorus, organic contaminants, and pesticides.
- 362 Management of Turfgrass Pests**
Fall. 4(3-2) Interdepartmental with Plant Pathology; Entomology. P:M: (CSS 232)
Chemical, biological, and cultural methods of managing weeds, diseases, and insect pests of turfgrass. Environmental considerations in pest management.
- 380 Crop Physiology**
Spring of even years. 3(2-3) P:M: (CSS 101) and (BOT 105 or BOT 301)
Physiological and metabolic function of plants from a whole plant viewpoint. Environmental effects on crop growth, development, and yield.
- 382 Turfgrass Physiology**
Spring. 2(3-0) Interdepartmental with Horticulture. P:M: (CSS 232) Completion of Tier I writing requirement. RB: (PLB 105) SA: CSS 282, CSS 068 Not open to students with credit in CSS 332.
Physiological principles of turfgrass growth and development. Water relations, light, temperature, respiration, photosynthesis, mineral nutrition, and hormone action. Impact of mowing, cultivation, and traffic on turfgrass growth. Offered first ten weeks of semester.
- 402 Principles of Weed Science**
Fall. 3(2-2) RB: (BOT 105 and CEM 143) R: Not open to freshmen or 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. 3(3-0) Interdepartmental with Forestry. Administered by Department of Forestry. P:M: (CSS 210) and (BOT 105 or BS 110) RB: (ZOL 355)
Ecological interactions crucial to the sustainable management of crop and forest ecosystems. Plant resources, competition, community development and dynamics, biodiversity, primary productivity, nutrient cycling, ecosystem structure and function, and impacts of global environmental change.
- 404L Forest and Agricultural Ecology Laboratory**
Fall. 1(0-3) Interdepartmental with Forestry. Administered by Department of Forestry. P:M: (CSS 210) and (BOT 105 or BS 110) and (FOR 404 or concurrently) RB: (ZOL 355)
Field studies and data analysis of ecological processes central to the sustainable management of forest and agricultural resources. Field exercises cover primary production, community structure, soil resources, biodiversity, succession, nutrient cycling, critiques of primary literature. Two weekend field trips required.
- 406 Seed Production and Technology**
Fall of even years. 3(2-2) P:M: (CSS 101 and CSS 350) R: Not open to freshmen or 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.
- 425 Microbial Ecology**
Spring. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. Administered by Department of Microbiology and Molecular Genetics. RB: (MMG 301) SA: MPH 425
Microbial population and community interactions. Microbial activities in natural systems, including associations with plants or animals.
- 426 Biogeochemistry**
Summer. 3 credits. Summer: Given only at W.K. Kellogg Biological Station. Interdepartmental with Microbiology and Molecular Genetics; Geological Sciences; Zoology. Administered by Department of Microbiology and Molecular Genetics. RB: (BS 110 or LBS 144 or LBS 148H or BS 111 or LBS 145 or LBS 149H) and (CEM 143 or CEM 251) SA: MPH 426
Integration of the principles of ecology, microbiology, geochemistry, and environmental chemistry. Societal applications of research in aquatic and terrestrial habitats.
- 430 Soil Fertility and Chemistry**
Spring. 3(2-2) P:M: (CSS 210) R: Not open to freshmen or sophomores.
Application of chemistry to diagnosing and improving soil fertility. Soil amendments including macro- and micro-nutrients. Reducing environmental degradation.
- 431 Soil and Plant Resources for Sustained World Food and Fiber Production**
Spring of odd years. 3(3-0) P:M: (CSS 101 and CSS 210)
World food and fiber production capacities related to soil and climatic resources. Management and utilization of genetic resources for sustained production of human foods and animal feeds.
- 440 Soil Biophysics**
Fall of even years. 3(2-2) P:M: (CSS 210) R: Not open to freshmen or 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 of even years. 4(3-2) Interdepartmental with Forestry; Horticulture. P:M: (CSS 350)
Plant improvement by genetic manipulation. Genetic variability in plants. Traditional and biotechnological means of creating and disseminating recombinant genotypes and cultivars.
- 451 Biotechnology Applications for Plant Breeding and Genetics**
Spring. 3(2-2) Interdepartmental with Forestry; Horticulture. RB: (CSS 350 or ZOL 341) and (CSS 441)
Principles, concepts, and techniques of agricultural plant biotechnology. Recombinant DNA technology, plant molecular biology and transformation in relation to plant improvement.
- 452 Watershed Concepts**
Fall, Spring, Summer. 3(3-0) Interdepartmental with Resource Development; Biosystems Engineering; Forestry; Fisheries and Wildlife. Administered by Department of Community, Agriculture, Recreation and Resource Studies. P:M: (RD 324 and ZOL 355) RB: organic chemistry
Watershed hydrology and management. The hydrologic cycle, water quality, aquatic ecosystems and social systems. Laws and institutions for managing water resources.
- 455 Pollutants in the Soil Environment**
Fall. 3(3-0) P:M: (CEM 143) and completion of Tier I writing requirement. R: Open only to seniors or graduate students.
Chemical and biological reactions of organic and inorganic pollutants in soils.
- 464 Statistics for Biologists**
Fall. 3(3-0) Interdepartmental with Statistics and Probability; Animal Science. Administered by Department of Statistics and Probability. RB: (STT 421)
Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression. Analyses of counted and measured data to compare several biological groups including contingency tables and analysis of variance.
- 470 Soil Resources**
Fall. 3(2-3) RB: (CSS 210) R: Not open to freshmen or sophomores.
Evaluation of the properties, genesis, and classification of soil resources to assist in making land-use decisions. Field trips required.
- 477 Pest Management I: Pesticides in Management Systems**
Fall. 3(3-0) Interdepartmental with Entomology; Fisheries and Wildlife; Horticulture. Administered by Department of Entomology. RB: (CEM 143 or CEM 251) and (BOT 405 and CSS 402) and (ENT 404 or ENT 470 or FW 328)
Chemistry, efficient use, and environmental fate of pesticides. Legal and social aspects of pesticide use.

- 478 Pest Management II: Biological Components of Management Systems (W)**
Spring of even years. 3(2-3) Interdepartmental with Entomology; Forestry; Fisheries and Wildlife; Horticulture. Administered by Department of Entomology. P:M: (ENT 404 or ENT 470 or PLP 405 or CSS 402) and completion of Tier I writing requirement. Principles of host plant resistance and biological control and their relationship to the design of agroecosystems. Classification of insect biological control agents.
- 486 Biotechnology in Agriculture: Applications and Ethical Issues**
Fall of even years. 3(3-0) Interdepartmental with Horticulture; Forestry; Philosophy. Administered by Department of Horticulture. P:M: (BOT 105 or BS 111) RB: (CSS 350 or ZOL 341) R: Not open to freshmen or sophomores.
Current and future roles of biotechnology in agriculture: scientific basis, applications. Environmental, social, and ethical concerns.
- 488 Agricultural Cropping Systems: Integration and Problem Solving**
Spring. 3(2-2) P:M: (CSS 101 and CSS 210) and completion of Tier I writing requirement. RB: (CSS 310 and CSS 430 and PLP 405 and ENT 404) Course work in crop production and management. R: Open only to seniors in the College of Agriculture and Natural Resources.
Integration and synthesis of agronomic and related concepts in agricultural cropping systems. Problem solving and application of information.
- 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:M: (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.
- 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:M: (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.
- 492 Professional Development Seminar II**
Fall. 1(0-2) P:M: (CSS 210 and CSS 272) and completion of Tier I writing requirement. R: Open only to seniors in the Department of Crop and Soil Sciences.
Synthesis, integration and application of agronomic principles to current issues in agronomy via discussion and oral and written communication.
- 493 Professional Internship in Crop and Soil Sciences**
Fall, Spring, Summer. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: Completion of Tier I writing requirement. R: Approval of department; application required. A student may earn a maximum of 6 credits for any or all of these courses: ABM 493, AEE 493, ANR 493, ANS 493, CSS 493, EEP 493, FIM 493, FW 493, HRT 493, PKG 493, PLP 493, PRR 493, and RD 493.
Supervised professional experiences in agencies and businesses related to crop and soil sciences and environmental soil sciences.
- 494 International Agriculture Seminar**
Spring of odd years. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. P:M: Completion of Tier I writing requirement.
Global food, soil and water resources issues.
- 499 Undergraduate Research**
Fall, Spring, Summer. 3(0-9) R: Approval of department; application required.
Faculty supervised research in a selected area of crop and soil sciences or environmental soil science.
- 805 Herbicide Action and Metabolism**
Spring of odd years. 2(2-0)
Properties and characteristics of herbicides. Processes involved in herbicide action, transport, and fate in plants and soils.
- 819 Advanced Plant Breeding**
Fall. 3(3-0) Interdepartmental with Horticulture; Forestry. Administered by Department of Horticulture. RB: (CSS 450 and STT 422)
Genetic expectations resulting from breeding strategies with cross- and self-pollinated crop plants. Germplasm collections, mapping populations, and modifications of reproductive biology useful for crop improvement.
- 820 Plant Reproductive Biology and Polyploidy**
Spring. 1 credit. Interdepartmental with Horticulture; Forestry; Plant Pathology; Plant Biology. Administered by Department of Horticulture. RB: Introductory Genetics and Plant Biology
Genetic processes underlying variations in plant reproductive biology and polyploidy and the utilization of these characteristics in plant breeding.
- 821 Crop Evolution**
Spring of odd years. 1 credit. Interdepartmental with Horticulture; Forestry; Plant Pathology; Plant Biology. Administered by Department of Horticulture. RB: Introductory Genetics and Plant Biology
Cultural and biological aspects of the evolution of domestic plants.
- 822 Historical Geography of Crop Plants**
Spring of odd years. 1 credit. Interdepartmental with Horticulture; Forestry; Plant Pathology; Plant Biology. Administered by Department of Horticulture. RB: Introductory Genetics and Plant Biology
Development and spread of the major crop species.
- 825 Clay Mineralogy and Soils Genesis**
Spring of even 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.
- 827 Techniques in Cytogenetics**
Fall of odd years. 1(0-3) Interdepartmental with Forestry; Horticulture.
Preparation of chromosomes from commercially important plants for cytogenetic analysis.
- 829 Advanced Microbial Ecology**
Spring of odd years. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. Administered by Department of Microbiology and Molecular Genetics.
Functional roles of microorganisms, their population dynamics and interactions, and their mechanisms of evolutionary change in natural communities, laboratory experiments, and mathematical models.
- 832 Environmental and Natural Resource Law**
Fall. 3(3-0) Interdepartmental with Resource Development; Agricultural Economics; Forestry; Geography. Administered by Department of Community, Agriculture, Recreation and Resource Studies. RB: (RD 430)
Origin and development of environmental law. Theories of power, jurisdiction, sovereignty, property interests, pollution, and other bases for legal controls of natural resources. Common law and constitutional limitations on governmental power.
- 837 Confocal Microscopy**
Fall, Spring. 2(2-2) Interdepartmental with Natural Science. Administered by College of Natural Science.
Confocal imaging, theory and practice. Basic optics. Lasers. Light paths for transmission, fluorescence and reflection. Image quality, analysis and processing.
- 840 Soil Physics**
Fall of odd 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.
- 841 Soil Microbiology**
Spring of even years. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. Administered by Department of Microbiology and Molecular Genetics. RB: (MMG 425) SA: MPH 841
Ecology, physiology, and biochemistry of microorganisms indigenous to soil.
- 842 Population Genetics, Genealogy and Genomics**
Fall. 3(3-0) Interdepartmental with Forestry; Animal Science; Genetics; Fisheries and Wildlife; Horticulture. Administered by Department of Forestry. RB: Pre-calculus, basic genetics
Population genetic processes underlying patterns of molecular genetic variation. Genealogical approaches to the study of genomic diversity, phylogenetic reconstruction, and molecular ecology.

Crop and Soil Sciences—CSS

- 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.
- 853 Plant Mineral Nutrition**
Fall of odd years. 3(3-0) Interdepartmental with Horticulture. RB: (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.
- 856 Plant Molecular Biology**
Spring. 3(3-0) Interdepartmental with Plant Biology; Biochemistry and Molecular Biology. Administered by Department of Plant Biology. RB: (ZOL 341) SA: BOT 856
Recent advances in genetics and molecular biology of higher plants.
- 863 Mineral-Water Interactions**
Fall of even years. 4(3-2) Interdepartmental with Geological Sciences. Administered by Department of Geological Sciences. R: Open only to graduate students in Crop and Soil Sciences or Geological Sciences or Geography.
Mineralogy, petrology and geochemistry of fluid-rock reactions in geologic, sedimentary and geochemical cycles. Rock and mineral weathering, soil formation, genesis and burial diagenesis of sediments and sedimentary rocks, and metamorphism.
- 865 Organic Chemistry of Soils**
Spring of odd years. 2(2-0)
Chemistry of natural and anthropogenic organic substances in soils.
- 870 Techniques of Analyzing Unbalanced Research Data**
Spring. 4(4-0) Interdepartmental with Animal Science; Forestry; Fisheries and Wildlife; Horticulture. Administered by Department of Animal Science. RB: (STT 464) R: Open only to graduate students in the College of Agriculture and Natural Resources. SA: ANS 943 Not open to students with credit in ANS 943.
Linear model techniques to analyze biological research data characterized by missing and unequal number of observations in classes. Simultaneous consideration of multiple factors. Prediction of breeding values and estimation of population parameters from variance and covariance components.
- 880 Scientific Communication and Professional Development**
Spring. 1(0-2)
Interactive professional experiences including grant-proposal preparation and presentation, scientific presentations, mock position interviews, and resume preparation.
- 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.

- 891 Current Topics in Ecology and Evolution**
Summer. 1 credit. Summer: Given only at W.K. Kellogg Biological Station. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Zoology; Plant Biology. Administered by Department of Zoology.
Presentation and critical evaluation of theoretical and empirical developments by visiting scientists.
- 891B Selected Topics in Plant Breeding and Genetics**
Fall, Spring, Summer. 1 to 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Horticulture; Forestry. Administered by Department of Horticulture. R: Open only to graduate students in Plant Breeding and Genetics or Genetics. Approval of department.
Selected topics in plant breeding.
- 892 Plant Breeding and Genetics Seminar**
Fall, Spring, Summer. 1(1-0) A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Horticulture; Forestry. Administered by Department of Horticulture.
Experience in review, organization, oral presentation, and analysis of research.
- 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.
- 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.
Master's thesis research.
- 921 Contemporary Statistical Models in Biology**
Fall of odd years. 3(3-0) RB: (STT 465) or approval of department. Working knowledge of SAS software.
Estimating functions. Growth models, generalized linear models, linear and non-linear mixed models. Field experiments with spatial trends. Longitudinal data. Modeling in the presence of spatial and temporal correlations.
- 941 Quantitative Genetics in Plant Breeding**
Spring of even years. 3(2-2) Interdepartmental with Forestry; Horticulture. RB: (CSS 819 and STT 464)
Theoretical and genetic basis of statistical analysis of quantitative traits using genetic markers. Computational tools for the study of quantitative traits.
- 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.
Doctoral dissertation research.

EARTH SCIENCE ES

Department of Geological Sciences College of Natural Science

- 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 EC

Department of Economics College of Social Science

- 201 Introduction to Microeconomics**
Fall, Spring, Summer. 3(3-0) 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.
- 202 Introduction to Macroeconomics**
Fall, Spring, Summer. 3(3-0) 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.
- 210 Economics Principles Using Calculus**
Fall. 3(3-0) P:M: (MTH 133 or MTH 153H or MTH 126) Not open to students with credit in EC 201 or EC 202.
A combined microeconomics and macroeconomics course. Emphasis on topics of interest in engineering and management, such as discounting, cost-benefit analysis, innovation, externalities, and the role of government regulation.
- 251H Microeconomics and Public Policy**
Fall, Spring. 4(4-0) 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.
- 252H Macroeconomics and Public Policy**
Fall, Spring. 3(3-0) P:M: (EC 201 and EC 301) or (EC 251H) 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.

- 293 Cooperative Education for Business Students**
 Fall, Spring. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. Interdepartmental with Marketing and Supply Chain Management; Accounting; Finance; Management; Hospitality Business. Administered by Department of Marketing and Supply Chain Management. R: By permission of the Department only.
 Integration of pre-professional educational employment experiences in industry and government with knowledge and processes taught in the student's academic program. Educational employment assignment approved by the Department of Marketing and Supply Chain Management.
- 301 Intermediate Microeconomics**
 Fall, Spring, Summer. 3(3-0) P:M: (EC 201) RB: (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.
- 302 Intermediate Macroeconomics**
 Fall, Spring, Summer. 3(3-0) P:M: (EC 201 and EC 202) Not open to students with credit in EC 252H.
 National income accounting. Determination of aggregate output, employment, price level, and inflation rate. Policy implications.
- 306 Comparative Economic Systems**
 Fall. 3(3-0) P:M: (EC 201 or EC 251H) and (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.
- 310 Economics of Developing Countries**
 Spring. 3(3-0) P:M: (EC 201 or EC 251H)
 Overview of economic patterns and policy issues of developing countries such as modern economic growth and structural transformation, state controls versus markets, poverty and human welfare, investments in human resources, and trade and industrialization.
- 320 Analysis of Economic Data**
 Fall, Spring. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H) R: Not open to students in the Department of Accounting or Department of Finance or School of Hospitality Business or Department of Management or Department of Marketing and Supply Chain Management.
 Sources of economic data. Techniques for presenting and summarizing economic data. Testing theories of economic behavior. Methods for forecasting in uncertain economic environments. Evaluation of current quantitative work in economics.
- 330 Money, Banking, and Financial Markets**
 Fall, Spring, Summer. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H)
 Money markets and financial intermediation. Money, the Federal Reserve System, and monetary policy. Regulation of money markets.
- 335 Taxes, Government Spending and Public Policy**
 Fall, Spring, Summer. 3(3-0) Interdepartmental with Environmental Economics and Policy. P:M: (EC 201 or EC 251H) SA: PRM 335 Not open to students with credit in EC 435 or EC 436.
 Economics of the public sector. Public goods, externalities, design and incidence of the tax system. Equity and efficiency effects of government programs.
- 340 Survey of International Economics**
 Fall, Spring, Summer. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H) Not open to students with credit in EC 440 or EC 441.
 Comparative advantage. Costs and benefits of trade. International economic policies. Balance of payments. Foreign exchange markets. The international monetary system. Contemporary trade and international currency issues.
- 360 Private Enterprise and Public Policy**
 Fall, Spring, Summer. 3(3-0) P:M: (EC 201 or EC 251H)
 Effects of antitrust, economic regulation, and other public policies on competition, monopoly, and other market problems in the United States economy.
- 380 Labor Relations and Labor Market Policy**
 Fall, Spring, Summer. 3(3-0) P:M: (EC 201 or EC 251H)
 Development, functions, legal framework, and economic effects of unions and collective bargaining. Institutions and economic impacts of government programs. Minimum wages, workers' compensation, unemployment insurance, and antidiscrimination policies.
- 391 Special Topics in Economics**
 Fall, Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H) R: Approval of department.
 Special topics supplementing regular course offerings.
- 401 Advanced Microeconomics**
 Fall, Spring. 3(3-0) P:M: (EC 301 or EC 251H)
 Economics of uncertainty and incomplete information. Game theory and theories of oligopoly. Transaction costs. Advanced topics in welfare economics, general equilibrium, externalities, and public goods.
- 402 Advanced Macroeconomics**
 Fall, Spring. 3(3-0) P:M: (EC 251H or EC 301) and (EC 252H or EC 302)
 Consumption, investment, and monetary theories. The role of expectations. Theories of economic growth and cycles. Stabilization policies.
- 405 The Development of the American Economy**
 Spring. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H)
 Causes and consequences of American economic development. Economic analysis of topics such as British trade policies, slavery, industrialization, immigration, the Great Depression, wars and income distribution.
- 406 Economic Analysis of Russia and the Commonwealth of Independent States**
 Spring of even years. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H)
 Analysis of structure and performance of planning, transition economy, and post-transition economy in Russia and the commonwealth of independent states (CIS) with focus on micro foundations of macroeconomic outcomes.
- 410 Issues in the Economics of Developing Countries**
 Fall. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H)
 Topics in development economics, such as growth, technological change, structural transformation, poverty and inequality, investment in human resources, trade, international capital flows and the political economy of policy formation and governance.
- 412 Economic Analysis of Latin America**
 Fall of even years. 3(3-0) RB: (EC 201 or EC 251H) and (EC 202 and EC 252H)
 Population growth, agriculture, and urbanization. Dependence on primary exports and import protection. Inequality and populist-orthodox policy cycles. Hyperinflation, international debt crises, and adjustments. United States policy interests and interventions.
- 413 Economic Analysis of Asia**
 Spring of odd years. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H)
 Development of agriculture, industry, labor markets, and trade in some of the following: India and South Asia, China, the Pacific Rim countries, and Japan. Productivity, income distribution, finance, and planning.
- 414 Economic Analysis of Sub-Saharan Africa**
 Fall of odd years. 3(3-0) P:M: (EC 201 or EC 251H) and (EC 202 or EC 252H)
 African economic development in historical perspective. Contemporary development issues including agricultural policies, industrial development, foreign trade and aid, human resource investments, AIDS, and the political economy of economic and political policies and reforms.
- 420 Introduction to Econometric Methods**
 Fall, Spring. 3(3-0) P:M: (EC 201 or EC 210 or EC 251H) and (EC 202 or EC 252H) and (STT 315 or STT 421 or STT 430 or STT 441) and (MTH 124 or MTH 132 or MTH 152H)
 Specification, estimation, and interpretation of econometric models. Evaluation of current quantitative work in economics.
- 421 Advanced Econometric Methods**
 Spring of even years. 3(3-0) P:M: (EC 420)
 Panel data methods, instrumental variables, limited dependent variables, time series analysis, and other advanced topics.
- 425 Law and Economics**
 Fall. 3(3-0) Interdepartmental with Finance. P:M: (EC 201 or EC 251H)
 Application of economic analysis to the law. Property rights, takings, the Coase Theorem. The economics of regulation, crime and punishments, liability law, and public choice.

Economics—EC

- 435 Public Expenditures**
Fall. 3(3-0) P:M: (EC 251H or EC 301)
Expenditure theory. Objectives and rationale of government activity in the market system. Efficiency criteria in government decision-making. Public choice. Cost benefit analysis.
- 436 Public Revenues**
Spring. 3(3-0) P:M: (EC 251H or EC 301)
Principles and theory of efficiency and the incidence of taxation. Income and sales taxes and other major revenue sources.
- 440 International Trade**
Fall. 3(3-0) P:M: (EC 251H or EC 301)
Neoclassical and modern theories regarding trade patterns and commercial policies. Applications of theory to United States policy. Contemporary issues involving international trade of goods, services, and productive factors.
- 441 International Finance**
Spring. 3(3-0) P:M: (EC 252H or EC 302)
Neoclassical and modern theories pertaining to balance of payments and exchange rate determination. Macroeconomic performance under alternative exchange rate regimes. Contemporary issues involving international monetary arrangements.
- 453 Women and Work: Issues and Policy Analysis**
Spring. 3(3-0) Interdepartmental with Environmental Economics and Policy; Women's Studies. Administered by Department of Agricultural Economics. RB: (EC 201 or EC 202 or EEP 201 or concurrently) R: Not open to freshmen or sophomores.
Current and past quantity and quality of women's participation in the labor force. Gender differentials in earnings and occupations. Employment discrimination. Laws, especially affirmative action laws. Social policy effects. International issues.
- 460 American Industry: Structure and Behavior**
Fall, Spring. 3(3-0) P:M: (EC 251H or EC 301)
Market structure and performance. Empirical analysis of market definition, concentration, product differentiation, vertical integration, innovativeness, collusion, and entry deterrence.
- 480 Analysis of Labor Markets**
Fall, Spring. 3(3-0) P:M: (EC 251H or EC 301) and (EC 201 or EC 251H)
Labor supply and demand. Human capital, search, migration, and labor turnover. Analysis of unemployment and wage growth. Structure of wages, including economics of discrimination.
- 489 Senior Seminar for Policy and Applied Economics Majors (W)**
Fall. 3(3-0) P:M: (EC 251H or EC 301) and (EC 320) and completion of Tier I writing requirement. R: Open only to seniors in the Policy and Applied Economics major.
Capstone course for policy and applied economics majors. Reading and discussion concerning selected economics topics. Preparation and presentation of student research project.
- 490 Independent Study**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. R: Approval of department.
Research and reading course for students interested in doing independent work in economics under faculty supervision.
- 491 Advanced Topics in Economics**
Fall, Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:M: (EC 301 or EC 251H) and (EC 302 or EC 252H) and (MTH 124 or MTH 132 or MTH 152H) R: Approval of department.
Advanced work in specialized topics of economics.
- 495 Economics of Poverty and Income Distribution**
Fall. 3(3-0) P:M: (EC 201 or EC 251H)
Theory of the distribution of income and wealth. Concepts and measurement of welfare. Definitions of poverty. Effects of public and private programs on the poor.
- 498 Economics of Health Care**
Fall of odd years. 3(3-0) RB: (EC 201 or EC 251H)
Economic factors in determining health care costs, utilization, quality, and efficiency. Demand and insurance. Comparative health care systems. Public policy issues.
- 499 Senior Seminar for Economics Majors (W)**
Fall, Spring. 3(3-0) P:M: (EC 251H or EC 301) and (EC 252H or EC 302) and (EC 420) and completion of Tier I writing requirement. R: Open only to seniors in Economics.
Capstone course for economics majors. Reading and discussion concerning selected economics topics. Preparation and presentation of student research project.
- 801 Mathematical Applications in Economics**
Fall. 3(3-0) RB: (MTH 124 or MTH 132) R: Open only to master's students in Economics. Open only to graduate students in the Department of Agricultural Economics and doctoral students in the Business Administration major or approval of department.
Applications of mathematical tools in economic analysis. Matrix algebra, derivatives, partial derivatives, optimization, integration and linear differential equations.
- 805 Microeconomic Analysis**
Fall. 3(3-0) R: Open only to master's students in Economics. Open only to graduate students in the Department of Agricultural Economics and doctoral students in the Business Administration major or approval of department. Not open to students with credit in EC 812A.
Microeconomic theory with calculus. Production, costs, demand, markets, general equilibrium and welfare theory.
- 807 Applied Microeconomic Analysis**
Spring. 3(3-0) P:M: (EC 805)
Applications of microeconomic theory taken from public finance, labor economics, international trade, and industrial organization.
- 809 Macroeconomic Analysis**
Spring. 3(3-0) P:M: (EC 801) Not open to students with credit in EC 813A.
Closed- and open-economy macroeconomic theory with calculus. Inflation, unemployment, growth, business cycles, consumption, investment, and money demand. Policy debates and macroeconomic forecasting.
- 810 Institutional and Behavioral Economics**
Fall. 3(3-0) Interdepartmental with Agricultural Economics; Resource Development. Administered by Department of Agricultural Economics.
Relationships among institutions, individual and collective actions, and economic performance. Public choice, property rights, and behavioral theories of firms and bureaucracies.
- 811A Mathematical Applications in Economics**
Fall. 2(2-0) R: Open only to Ph.D. students in Economics, the Department of Agricultural Economics, and the Business Administration major or approval of department. C: EC 812A concurrently.
Applications of mathematical tools in economic analysis for Ph.D. students. Matrix algebra, derivatives, partial derivatives, optimization, integration and linear differential equations.
- 811B The Structure of Economic Analysis**
Fall. 2(2-0) P:M: (EC 811A) SA: EC 811 C: EC 813B concurrently.
Static and dynamic decision models in economics. Concepts of equilibrium, stability, comparative statics and duality.
- 812A Microeconomics I**
Fall. 3(3-0) C: EC 811A concurrently.
Consumption theory, including choice under uncertainty. Theory of production in perfectly competitive markets. General equilibrium in the presence of perfect competition. Efficiency properties of competitive equilibria.
- 812B Microeconomics II**
Spring. 3(3-0) P:M: (EC 812A)
Introduction to social choice. Market failure, including externalities, public goods, imperfect information and market power.
- 813A Macroeconomics I**
Fall. 3(3-0) R: Open only to Ph.D. students in Economics, the Department of Agricultural Economics, and the Business Administration major or approval of department.
Static and dynamic macroeconomic models. Search asset pricing, new classical theories of business cycles and growth. Rational expectations and the government budget constraint.
- 813B Macroeconomics II**
Spring. 3(3-0) P:M: (EC 813A) C: EC 811B concurrently.
New classical theories of business cycles and growth. Theories of price and wage rigidities, search, imperfect competition, and credit rationing in macroeconomic models. Asset pricing.
- 815 Economic Thought I**
Fall. 3(3-0)
Ancient, scholastic, and mercantilist economic thought. Origins and development of classical political economy. Socialist and Romantic reactions to classicism.

- 816 Economic Thought II**
Spring. 3(3-0)
German and English economic historicism. Austrian and general equilibrium economics. Neoclassical economics. Institutionalism. Origins and development of Keynesian economics. History of economic thought in retrospect.
- 818 Introduction to Econometrics**
Spring. 3(3-0) Interdepartmental with Agricultural Economics; Statistics and Probability. P:M: (EC 801 and STT 430) R: Not open to Economics Ph.D. students. SA: EC 820
The single equation regression model. Properties of least-squares estimators under various specifications. Multicollinearity, heteroskedasticity, serial correlation, generalized least squares.
- 819 Economic Role of Government**
Spring. 3(3-0)
The legal system and legal foundations of economic structure and performance. Property rights, the taking issue, and compensation.
- 820A Econometrics IA**
Fall. 3(3-0) Interdepartmental with Statistics and Probability. RB: Multivariate Calculus R: Open only to Ph.D. students in Economics, in the Department of Agricultural Economics, and the Business Administration major or approval of department.
Statistical tools for econometrics. Applications of statistical tools, including probability distributions, estimation, hypothesis testing, and maximum likelihood to econometric problems.
- 820B Econometrics IB**
Fall. 3(3-0) P:M: (EC 811A and EC 820A)
The single equation regression model. Properties of least-squares estimators under various specifications. Multicollinearity, generalized least-squares, errors in variables, seemingly unrelated regressions. Identification and estimation in simultaneous equations models.
- 821 Econometrics II**
Fall. 3(3-0) Interdepartmental with Agricultural Economics; Statistics and Probability. P:M: (EC 820A and EC 820B)
Analysis of cross-sectional economic data. Qualitative and limited dependent variables. Probit, logit, tobit, and sample selectivity. Duration models. Count data. Analysis of panel data.
- 822 Econometrics III**
Spring. 3(3-0) Interdepartmental with Agricultural Economics; Statistics and Probability. P:M: (EC 820A and EC 820B)
Dynamic models and time series data. ARMA models. ARCH models. Unit roots, cointegration and error correction. Rational expectations models.
- 823 Applied Econometrics**
Fall. 3(3-0) P:M: (EC 820A and EC 820B) or (STT 430 and EC 818)
Problems of estimating models and testing hypotheses from economic theory. Applications of various econometric models to economic problems and policy analysis.
- 824 Advanced Topics in Econometrics**
Spring of even years. 3(3-0) P:M: (EC 820A and EC 820B and EC 821 and EC 822) R: Open only to Ph.D. students in Economics or approval of department.
Advanced study in a specialized topic in econometrics.
- 827 Economic Forecasting**
Spring. 2(2-0) P:M: (MBA 814) R: Open only to MBA students.
Concepts, sources, measurement, and forecasts of economic data. Forecasting techniques. Time series analysis and economic models. Uses of economic models and forecasts in business decision making.
- 829 The Economics of Environmental Resources**
Fall. 3(3-0) Interdepartmental with Agricultural Economics; Forestry; Park, Recreation and Tourism Resources; Resource Development. Administered by Department of Agricultural Economics.
Economic principles related to environmental conflicts and public policy alternatives. Applications to water quality, land use, conservation, development, and global environmental issues.
- 830 Advanced Macroeconomics and Monetary Theory**
Fall. 3(3-0) P:M: (EC 812B and EC 813B)
General equilibrium models of monetary economies. Money and growth. Monetary and financial models of the business cycle. Hyperinflation. Bubbles, sunspots, cycles, and multiple equilibria.
- 831 Problems in Monetary Theory and Policy**
Spring. 3(3-0) P:M: (EC 809 or EC 813A) and (EC 820A and EC 820B)
Surveys several topics on macroeconomics with a strong applied emphasis.
- 835 Public Expenditures**
Fall. 3(3-0) P:M: (EC 805 or EC 812A)
Allocative and distributional effects of public expenditure. Public goods and externalities. Selected topics in public expenditure analysis such as cost-benefit analysis, fiscal federalism, mechanism design, public choice, general equilibrium models.
- 836 Public Revenues**
Spring. 3(3-0) P:M: (EC 805 or EC 812A)
Theory of taxation. Allocative and distributional effects of taxation, user charges, and deficit finance. Positive and normative aspects. General equilibrium models. Dynamic models. Issues of fiscal federalism.
- 840 International Trade: Theory and Commercial Policy**
Fall. 3(3-0) P:M: (EC 805 or EC 812A)
Commodity composition of trade. Welfare and distributional effects of measures such as tariffs, quotas, and export subsidies. International economic policy. Regional and multilateral trade policy.
- 841 Exchange Rates and Capital Flows**
Spring. 3(3-0) P:M: (EC 805 and EC 809) or (EC 812A and EC 813A)
The balance of payments statement. Mechanisms of balance of payments adjustment. Exchange rate determination. Domestic policies under alternative exchange rate regimes. Regional monetary integration. The international currency system.
- 843 Advanced Topics in International Trade**
Spring. 3(3-0) P:M: (EC 812A and EC 812B and EC 840)
Selected topics in international trade.
- 844 Open Economy Macroeconomics**
Fall. 3(3-0) P:M: (EC 813A and EC 813B)
Balance of payments. Dynamic models of the open economy. Effects of uncertainty on international financial markets. Global issues in economic growth. Money and exchange rates in models with sticky or flexible prices. Nominal price rigidities.
- 850 Growth, Development, and Human Resources**
Fall. 3(3-0) P:M: (EC 805 or EC 812A)
Theoretical and empirical models of the microeconomics of development, focusing on household and individual behavior related to investment in human resources and its consequences.
- 851 Microecon Dynamics in Develop**
Spring. 3(3-0) P:M: (EC 805 and EC 809) or (EC 812A and EC 813A)
Theoretical and empirical models of the microeconomics of development, focusing on land, labor, credit and insurance markets. Analysis of household and individual responses to risk, dynamic decisions with respect to savings, consumption and labor supply, and models of learning. EC 851 is designed to be a continuation of EC 850.
- 860 Market Structure and Behavior**
Fall. 3(3-0) P:M: (EC 805 or EC 812A)
The consequences of concentration and entry conditions. Theory of the firm as it relates to size, scope, integration, motivation. Static market behavior. Antitrust treatment of cartels and mergers.
- 861 Dynamic Market Behavior and Performance**
Spring. 3(3-0) P:M: (EC 805 or EC 812A)
Theoretical and empirical treatments of dynamic aspects of industry behavior. Strategic behavior, predation, and antitrust treatment. Research, development, innovation. Government controls. Public utilities and regulation.
- 880 Labor Economics I**
Fall. 3(3-0) P:M: (EC 805 or EC 812A) and (EC 820A and EC 820B) or (STT 430 and EC 818)
Labor supply and measurement of the labor force. Labor demand. Mobility, turnover, and migration. Equalizing wage differentials. Trade union growth, goals, bargaining and effects.
- 881 Labor Economics II**
Spring. 3(3-0) P:M: (EC 805 or EC 812A) and (EC 820A and EC 820B) or (STT 430 and EC 818)
Theories and empirical evidence on the human capital model and alternatives to the human capital model. Economics of discrimination and gender differences in labor markets. Employment and distributional effects of minimum wages.
- 895 Graduate Reading in Economics**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Faculty guided research projects.
- 911 Strategic Behavior in Economic Environments**
Fall. 3(3-0) P:M: (EC 812B)
Topics in cooperative and non-cooperative game theory. Applications include: oligopoly and bargaining theories, strategic voting and principal agent models, endogenous coalition formation, signalling, strategic trade, and auctions theories.
- 912 Risk, Uncertainty and Information**
Spring. 3(3-0) P:M: (EC 812A and EC 812B) RB: (EC 812A)
Effects of risk in economic environments. Topics include: expected utility theory, risk aversion, stochastic dominance, mean-variance models, state preference models, general equilibrium models with risk, information theory.

Economics—EC

- 923 Advanced Environmental and Resource Economics**
Fall. 3(3-0) Interdepartmental with Agricultural Economics; Forestry; Park, Recreation and Tourism Resources; Resource Development. Administered by Department of Agricultural Economics. RB: (AEC 829 and EC 812A)

Advanced economic theory of environmental management and policy. Treatment of externalities and market and non-market approaches to environmental improvement. Topics in conservation and sustainable economic growth. Applications to research and policy.

- 925 Advanced Natural Resource Economics**
Spring. 3(3-0) Interdepartmental with Agricultural Economics; Forestry; Resource Development; Park, Recreation and Tourism Resources. Administered by Department of Agricultural Economics. RB: (EC 812A and AEC 829 and FOR 866) SA: AEC 991H

Economic theory of managing nonrenewable and renewable resources, including optimal use, the incentives for use under decentralized markets, and public policy design. Analysis of the co-evolution of economic and ecological systems.

- 950 Research Seminar in Applied Economics**
Spring. 3(3-0) R: Open only to Ph.D. students in Economics.

Current research topics in applied economics.

- 951 Research Seminar in Economic Theory**
Spring. 3(3-0) R: Open only to Ph.D. students in Economics.

Current research topics in economic theory.

- 952 Research Seminar in Econometrics**
Spring. 3(3-0) R: Open only to Ph.D. students in Economics.

Current research topics in econometrics.

- 992 Advanced Topics in Economics**
Fall of odd years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. RB: (EC 811A and EC 811B and EC 812A and EC 812B and EC 813A and EC 813B and EC 820A and EC 820B) R: Open only to Ph.D. students in Economics or approval of department.

Advanced work in a specialized topic in economics.

- 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 Ph.D. students in Economics.

Doctoral dissertation research.

EDUCATION

ED

College of Education

- 870 Capstone Seminar**
Summer. 3(3-0) R: Open only to students in the Master of Arts in Education. Approval of college.

Reflection and synthesis of learning experiences in online masters program. Creation and exhibition of electronic portfolio on the Web. Participation in online discussion groups.

EDUCATIONAL ADMINISTRATION EAD

Department of Educational Administration College of Education

- 315 Student Leadership Training**
Fall, Spring. 3(2-2)

Student leadership role, skills, and technique, consistent with the principles and demands of a democratic multicultural society.

- 800 Organization Theory in Education**
Fall, Spring, Summer. 3(3-0)

Organizational theory and research applied to educational administration. Topics include comparative organization settings, external environments, organizational effectiveness, and ethics.

- 801 Leadership and Organizational Development**
Spring, Summer. 3(3-0)

Interaction of leadership with organizational culture and development within a variety of educational organizations.

- 802 Building a Learning Organization**
Spring. 3(3-0)

Disciplines and practices for crafting a learning organization. Examination of Eastern, Western, and Quantum models of organization dynamics. Emphasis on strategies and skills for increasing human capacity.

- 803 Planning, Budgeting, and Evaluation**
Spring. 3(3-0)

Planning, budgeting, and evaluation in educational organizations. Topics include needs assessment, funding sources, and processes for estimating costs and revenues.

- 804 Administration of Human Resources in Education**
Fall, Summer. 3(3-0)

Tasks of personnel management in schools, colleges, and other educational organizations, including recruitment, selection, orientation, development, compensation, and evaluations. Focus on attracting and retaining a quality workforce in education.

- 805 Administration in Higher Education**
Fall. 3(3-0)

Theories, systems, structures and processes of college and universities. Comparison of the organization, leadership, and governance of higher education institutions to other non-profit organizations.

- 806 Learning Leadership and Organizational Analysis I**
Fall. 3(3-0) R: Open only to graduate students in K-12 Educational Administration.

Leadership of K-12 schools and associated community organizations. Theory and skills needed to discern organizational dynamics of schools and community. Professional ethics of K-12 school leadership. Skills and methods of disciplined reflection applied to issues of leadership practice. Methods of reflection and applications of multiple theories to cases of practice.

- 807 Learning Leadership and Organizational Analysis II**
Spring. 2(2-0) P:M: (EAD 806) R: Open only to graduate students in K-12 Educational Administration.

Data-based organizational analysis of K-12 schools and school-community relations. Leadership skills to define vision strategies. Case analysis and double-loop learning.

- 809 Interpersonal Dimensions of Leadership**
Spring, Summer. 1(1-0) P:M: (EAD 806 and EAD 807 and EAD 808) RB: (EAD 820 and EAD 821) R: Open only to graduate students in K-12 Educational Administration.

Assessment of different approaches to school leadership. School leader as reflective practitioner and effective communicator in school and community contexts.

- 810 Use of Technology in School Administration**
Fall. 3(3-0)

Learning and leading in the knowledge age with special focus on the role of technology in educational management, communication, and curriculum and instruction.

- 813 Education, Development and Social Change**
Spring of odd years. 3(3-0) Interdepartmental with Teacher Education.

Rise of modern systems of education in developed and developing countries. Education, the state, and national development. Colonial heritage, linkages, and globalization of educational development.

- 820 Internship in Educational Administration I**

Fall, Spring. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to graduate students in K-12 Educational Administration.

Supervised internship in an educational institution focused on school leadership issues.

- 821 Internship in Educational Administration II**

Spring, Summer. 1 to 3 credits. R: Open only to graduate students in K-12 Educational Administration.

Supervised internship in an educational and/or community organization focused on school-community leadership issues.

- 845 Teaching, Learning, and School Restructuring**
Spring. 3(3-0)

Relationship between school-wide interventions and improvement in classroom teaching: school restructuring and reculturing, strategies for school improvement, approaches to teaching and learning.

- 850 Issues and Strategies in Multicultural Education**
Spring. 3(3-0)

Historical, pedagogical, and administrative considerations of multicultural education in K-16 educational settings.

- 852A Elementary and Middle School Administration**
Fall, Summer. 3(3-0)

Administration and supervision of elementary and middle schools. Alternative organizational arrangements, curricula, and practices. Problems and strategies for improving K-8 education.