

491. Selected Topics

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to Agriscience or Agriculture and Natural Resources Communications majors. Approval of department.

Topics selected to meet student needs in agriculture and natural resources communications or agriscience and natural resources education.

493. Professional Internship

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: (AEE 210) R: Not open to freshmen. Approval of department; application required. A student may earn a maximum of 6 credits in the following courses: AEE 493, ANR 493, ANS 493, FW 493, PKG 493, PRM 493, PRR 493, and RD 493.

Professional internship for students majoring in Agriculture Communications and Agriscience.

801. Global Development through Agricultural and Extension Education

Fall. 3(3-0)

Application of education theories: principles and practices in planning, conducting, and evaluating formal and nonformal education programs on international development.

802. Program Administration in Agricultural and Extension Education

Fall. 3(3-0)

Organizational and management concepts and practices in agricultural and extension education.

803. Instructional Strategies in Agricultural and Extension Education

Spring. 3(3-0)

Assessment of learning needs. Development, selection, use and evaluation of teaching strategies. Emphasis on agriscience education and adult learners.

804. Communication Strategies in Agricultural and Extension Education

Fall. 3(3-0) R: Open only to seniors and graduate students in College of Agriculture and Natural Resources.

Information delivery systems and presentation techniques for varied agricultural and extension audiences.

805. Leadership Development in Agricultural and Extension Education

Spring. 3(3-0)

Assessment of values, style, behavior, principles. Philosophical and sociological bases for leadership development. Applications.

806. Program Planning and Evaluation in Agricultural and Extension Education

Spring of odd years. Summer of even years. 3(3-0)

Principles, theories, and practices in developing and evaluating state and local agricultural and extension education programs.

807. Research in Agricultural and Extension Education

Fall. 3(3-0) R: Open only to graduate students in College of Agriculture and Natural Resources.

Planning, designing, conducting, and reporting research in agricultural and extension education.

811. Education Through Extension

Fall. 3(3-0)

Function, organization, and operation of extension education programs.

822. Teaching Supervised Agriscience Experiences

Summer of odd years. 3(3-0) R: Open only to graduate students in Agricultural and Extension Education.

Principles and practices of agriscience laboratory teaching in high schools.

890. Independent Study in Agricultural and Extension Education

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department.

891. Selected Topics in Agricultural and Extension Education

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 Agricultural and Extension Education.

Contemporary issues and problems in agricultural and extension education.

892. Seminar in Agricultural and Extension Education

Fall, Spring. 1(1-0) A student may earn a maximum of 2 credits in all enrollments for this course. Selected issues in agricultural and extension education.

893. Professional Field Experience in Agricultural and Extension Education

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to graduate students in Agricultural and Extension Education.

Practice, observation, and analysis through field experiences.

898. Master's Research

Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. R: Open only to master's degree students in Agricultural and Extension Education. Master's Plan B Research.

899. Master's Thesis Research

Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's degree students in Agricultural and Extension Education.

901. International Agricultural and Extension Education Systems

Spring. 3(3-0) P: AEE 801 or AEE 811 or AEE 821.

Systems of agricultural and extension education in different countries. Philosophical and structural differences and similarities.

907. Research Project Design and Implementation

Spring. 3(3-0) P: AEE 807 or approval of department.

Selection and development of research instruments. Quantitative and qualitative data analysis in agricultural and extension education.

911. Nonformal Learning

Fall of even years. Summer of odd years. 3(3-0) P: AEE 811.

Theories and philosophies of learning in out-of-school settings. Alternative strategies.

912. Advanced Extension Administration

Spring. 3(3-0) P: AEE 802. R: Open only to graduate students in College of Agriculture and Natural Resources.

Advanced practices and applications necessary for effective management and administration within extension education.

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 Agricultural and Extension Education.

AGRICULTURAL ECONOMICS AEC

**Department of Agricultural Economics
College of Agriculture and Natural Resources**

800. Foundations of Agricultural Economics

Fall. 3(3-0)

Concepts of agricultural economics drawn from economic and management theory. Applications to economic decisions and policy issues related to agricultural, food, and natural resource firms, markets, and institutions.

800A. Mathematical Applications in Agricultural Economics

Fall. 1(1-0) C: AEC 800 concurrently.

Basic mathematical tools for use in agricultural economics applications.

810. Institutional and Behavioral Economics

Fall. 3(3-0) Interdepartmental with Economics; and Resource Development.

Relationships among institutions, individual and collective actions, and economic performance. Public choice, property rights, and behavioral theories of firms and bureaucracies.

817. Political Economy of Agricultural and Trade Policy

Spring. 3(3-0) P: EC 805 or EC 812A; EC 809 or EC 813A.

Concepts of policy analysis and decision. Agricultural sector problems, behavior, and policy in the development process. Macroeconomic and trade impacts. International policies affecting trade and development. Current policy issues.

Descriptions—Agricultural Economics of Courses

820. Econometrics I

Spring. 3(3-0) Interdepartmental with Economics; and Statistics and Probability. Administered by Economics. P: EC 801, STT 430.

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 Economics; and Statistics and Probability. Administered by Economics. P: EC 820, STT 442.

Estimation and hypothesis testing. Asymptotic properties of optimization estimators. Analysis of cross-sectional economic data. Qualitative and limited dependent variables. Probit, logit, tobit, and sample selectivity. Duration models. Count data.

822. Econometrics III

Spring. 3(3-0) Interdepartmental with Economics; and Statistics and Probability. Administered by Economics. P: EC 820, STT 442.

Dynamic models and time series data. ARMA models. ARCH models. Unit roots, cointegration and error correction. Rational expectations models.

829. The Economics of Environmental Resources

Fall. 3(3-0) Interdepartmental with Economics; Forestry; Park, Recreation and Tourism Resources; and Resource Development.

Economic principles related to environmental conflicts and public policy alternatives. Applications to water quality, land use, conservation, development, and global environmental issues.

831. Food Marketing Management

Spring. 3(3-0) Interdepartmental with Marketing and Supply Chain Management. Administered by Marketing and Supply Chain Management. P: MBA 820 or MSC 805

Marketing management decisions in food firms. Consumer orientation, computer technologies, food system cost reduction, global opportunities, environmental and social issues.
SA: ML 831, MTA 831

832. Environmental and Natural Resource Law

Fall. 3(3-0) Interdepartmental with Resource Development; Crop and Soil Sciences; Forestry; and Geography. Administered by Resource Development. P: 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.

835. Introductory Econometrics

Spring. 3(3-0) P: STT 430.

Estimation and interpretation of multiple regression models and their modifications when usual assumptions are not valid. Applications focus on problems faced by agricultural economists.

837. Water Law

Spring. 3(3-0) Interdepartmental with Resource Development; and Forestry. Administered by Resource Development. P: RD 430.

Legal principles applicable to surface water and groundwater, private and public water rights, and controls over water resources. Cases, statutes, and administrative procedures.

838. Land Use Law

Spring. 3(3-0) Interdepartmental with Resource Development; Forestry; and Urban Planning. Administered by Resource Development. P: RD 430.

Public and private land use controls in the U.S. Civil rights, housing, energy problems, growth management, waste management, and land conservation. Cases, statutes and other regulations.
SA: RD 834

839. Applied Operations Research

Fall. 3(3-0) P: (EC 801)

Linear and nonlinear programming, spatial equilibrium models, and risk programming. Applications in agribusiness management and in agricultural, environmental, and natural resource economics.

SA: AEC 891B

841. Analysis of Food System Organization and Performance

Spring. 3(3-0)

Industrial organization, subsector, and transaction cost approaches to analyzing coordination and performance of agricultural markets, contracting, and integration in the food systems of industrialized and developing countries. Applications to issues of organization, control, and public policy.

845. Commodity Market Analysis

Fall. 3(3-0) P: AEC 835.

Applied econometric analysis of commodity markets. Emphasis on specification and estimation of demand and supply models for forecasting. Modeling for policy evaluation. Futures and options markets. Microcomputer applications.

851. Agricultural Firm Management

Summer. 3(3-0)

Managerial processes for planning and controlling agricultural firms. Applications of financial concepts, budgets, simulations, and cognitive and information systems to developed and developing countries. Predictive and prescriptive analysis.

853. Financial Management in Agriculture

Spring. 3(3-0)

Financial and investment analysis tools and concepts and their application to decisions faced by agricultural, agribusiness, and food industry firms. Financial institutions and instruments, credit programs, and financial sector performance in low-income and high-income countries.

855. Agricultural Production Economics

Spring. 3(3-0) P: (EC 801 and EC 805) and (AEC 835 or concurrently or EC 823)

Analysis of production models using econometrics, mathematical programming, and simulation. Systems science perspective.

857. Strategic Management in Agribusiness

Fall. 3(3-0)

Managerial problems faced by agribusiness firms. Strategies to interpret and respond to forces affecting the industry. Case study approach.
SA: AEC 891A

861. Agriculture in Economic Development

Fall. 3(3-0)

Role of agriculture in economic development of low- and middle-income countries. Theories of agricultural growth. Policy issues. Case studies.

865. Agricultural Benefit-Cost Analysis

Spring. 3(3-0)

Benefit-cost analysis of agricultural and natural resource projects, including financial and economic analysis. Case studies in project design and appraisal in low and high income countries.

874. Field Data Collection and Analysis in Developing Countries

Summer of odd years. 3(3-0) P: (AEC 861)

Designing and conducting socioeconomic surveys to inform agricultural production, marketing, and environment/natural resource issues in developed and developing countries. Research proposal preparation, questionnaire design, sampling, data collection, and data processing and analysis using computers.
SA: AEC 891C

890. Independent Study

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in Agricultural Economics. Approval of department.

Independent study of selected topics in agricultural economics.

891. Topics in Agricultural Economics

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course.

Selected topics in analytical methods, agri-food systems economics and management, and agricultural and natural resource development and policy.

898. Master's Research

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to graduate students in Agricultural Economics. Approval of department.

Master's degree Plan B research.

899. Master's Thesis Research

Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to graduate students in Agricultural Economics. Approval of department.

923. Advanced Environmental and Resource Economics

Spring of even years. 3(3-0) Interdepartmental with Economics; Forestry; Park, Recreation and Tourism Resources; and Resource Development. P: (AEC 829 and EC 805)

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. Environmental and Resource Economics Research

Spring of odd years. 3(3-0) Interdepartmental with Forestry; Resource Development; Park, Recreation and Tourism Resources; and Economics. P: (AEC 829 and EC 805)

Topics such as contingent or non-market valuation, institutional analysis, pollution prevention, environmental quality and location, recreational demand modeling, and environmental risk management. Research process in environmental and resource economics.

SA: AEC 991H

930. Dynamic Models in Agricultural and Resource Economics

Spring. 3(3-0) P: (EC 801 and EC 812A) R: Open only to Ph.D. students in the College of Agriculture and Natural Resources or College of Business or College of Social Science or approval of department.

Methods of dynamic optimization and their application to agricultural and natural resources problems. Discrete time dynamic programming, calculus of variations, and discrete time maximum principle.

SA: AEC 991E

961. Seminar in International Agricultural Development

Fall of even years. 3(3-0) P: (AEC 861 and EC 805 and EC 809) R: Open only to Ph.D. students in the College of Agriculture and Natural Resources or College of Business or College of Social Science.

Advanced topics and analytical methods in international agricultural development research. New theories and their application to specific problems.

SA: AEC 991B

977. Professional Practice in Agricultural Economics

Spring. 3(3-0) R: Open only to Ph.D. students in the Department of Agricultural Economics or Department of Economics.

Matching appropriate tools to applied problems in agricultural and resource economics. Individual and team preparation, under tight deadlines, of professional analyses and oral presentations for diverse audiences. Use of peer review.

SA: AEC 947.

978. Research Methodologies in Agricultural and Resource Economics

Spring. 3(3-0) R: Open only to Ph.D. students in the College of Agriculture and Natural Resources or College of Business or College of Social Science.

Alternative research philosophies, types of knowledge, and kinds of research. Critical appraisal of facts, theories, and values in economic research. Testing and communication of research results. Development of a research proposal.

SA: AEC 991F

991. Advanced Topics in Agricultural Economics

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to Ph.D. students in the College of Agriculture and Natural Resources, College of Business, and College of Social Science; or with department approval.

Advanced topics such as price analysis, finance, risk and modeling techniques, agri-food systems, environmental economics and management, and agricultural and natural resource development and policy.

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 Agricultural Economics. Approval of department.

AGRICULTURAL ENGINEERING

AE

**Department of Agricultural Engineering
College of Agriculture and Natural Resources**

852. Systems Modeling and Simulation

Fall of even years. 3(3-0) Interdepartmental with Fisheries and Wildlife; Forestry; and Resource Development. Administered by Fisheries and Wildlife. P: STT 422 or STT 442 or STT 464 or GEO 463.

General systems theory and concepts. Modeling and simulation methods. Applications of systems approach and techniques to natural resource management, and to ecological and agricultural research.

853. Applied Systems Modeling and Simulation for Natural Resource Management

Spring of odd years. 3(2-2) Interdepartmental with Fisheries and Wildlife; Forestry; Resource Development; and Zoology. Administered by Fisheries and Wildlife. P: FW 820 or BE 486 or ZOL 851 or approval of department. R: Open only to seniors and graduate students

Mathematical models for evaluating resource management strategies. Stochastic and deterministic simulation for optimization. System control structures. Team modelling approach.

AGRICULTURAL TECHNOLOGY AND SYSTEMS MANAGEMENT

ATM

**Department of Agricultural Engineering
College of Agriculture and Natural Resources
College of Engineering**

150. Metal Fabrication Technology

Fall. 2(1-2) R: Open only to students in the Biosystems Engineering or Building Construction Management major.

Physical principles and safety techniques for electric and gas welding. Soldering, brazing, cutting, tool use, machine shop equipment use, and hot and cold metalworking.

195. National Electrical Code Review

Fall. 3(3-0) P: (AE 094 or BCM 230)

Electrical installation problems. Principles of and compliance with the National Electrical Code.

SA: AE 095

240. Machine Systems and Management

Spring. 3(2-2) P: (CSE 101 or CSE 131 or AT 090)

Principles, analysis, performance, operation, and management of agricultural machines.

252. Gasoline and Diesel Engine Technology

Fall. 3(2-2)

Operating principles of gasoline and diesel engines and their systems. Operation and maintenance requirements.

254. Fluid Power Technology

Spring. 2(1-2) R: Open only to students in Agriculture and Natural Resources.

Fluid power in mobile equipment. Operation and characteristics of system components and circuits. Component disassembly. System testing and diagnosis. Offered first ten weeks of semester.

261. Principles of Animal Environments

Spring. 2(1-2) Interdepartmental with Animal Science.

Animal environment requirements. Heat and moisture production rates. Psychrometrics of air and building materials. Heat loss and ventilation systems. Offered first ten weeks of semester.

SA: AE 061, ATM 326

431. Irrigation, Drainage and Erosion Control Systems

Fall. 3(2-2) P: MTH 116 or MTH 120; CSS 210. R: Not open to freshmen and sophomores.

Principles of soil and water conservation engineering including: land and soil surveying, basic hydraulics, hydrology, soil moisture, and soil and water conservation practices with applications to irrigation, drainage and erosion control systems.