

**410 Advanced Professional Seminar in Agribusiness Management**  
Fall. 1(1-0) P:M: (ABM 210) R: Open only to juniors or seniors in the Agribusiness Management Specialization. Open only to juniors or seniors in the Agribusiness Management, Animal Science, Crop and Soil Science, or Horticulture majors.

Advanced professional problems and reestablishment of career planning in the agri-food system. Industry trends, career alternatives, and job search strategies. Enhanced verbal, written, and visual communication techniques.

**422 Vertical Coordination in the Agri-Food System**  
Fall. 3(3-0) Interdepartmental with Food Industry Management. P:M: (ABM 100 and EC 201) R: Open only to juniors or seniors. SA: FSM 443

Analysis of vertical coordination in the industrialized agri-food system. Agricultural cooperatives, contracts, marketing orders, and trade associations. Analysis of imperfect competition and methods of conducting business. Interaction with legal systems and government.

**424 Information and Market Intelligence in the Agri-Food Industry**  
Spring. 3(3-0) Interdepartmental with Food Industry Management. Administered by Department of Agricultural Economics. P:M: (FIM 220 or concurrently and EC 201)

Researching agri-food issues, food industry business environments, and agri-food industry trends. Information gathering. Electronic library reference sources. Synthesis of data and information into market intelligence.

**425 Commodity Marketing II**  
Fall. 3(3-0) P:M: (ABM 225) and (STT 200 or STT 201 or STT 315 or ANS 314 or concurrently) SA: FSM 441

Advanced application of supply, space demand, and prices in commodity markets. Futures and options and their role in forward pricing. Risk management. Agricultural and food markets.

**427 Global Agri-Food Industries and Markets**  
Fall. 3(3-0) Interdepartmental with Food Industry Management. P:M: (FIM 220 or ABM 225)

Strategic understanding of the international agri-food system. Analysis of global production, marketing, and consumption. Knowledge of changing conditions in international industries and markets. Global trends and opportunities.

**430 Farm Management II**  
Fall. 3(4-0) P:M: (ABM 130) R: Open only to juniors or seniors. SA: FSM 330

Advanced management, planning, and control of farm production, marketing, financial activities, economic principles, budgeting and financial statements.

**435 Financial Management in the Agri-Food System**  
Spring. 3(3-0) RB: (ACC 201 or ACC 230) and (ABM 130 or ABM 100 or EC 201 or EC 202) R: Open only to juniors or seniors. SA: FSM 412

Analysis of agricultural business performance using financial statements. Capital budgeting of durable investments. Risk. Alternative methods to control capital asset services. Financial markets and credit institutions affecting agriculture and food.

**437 Agribusiness Strategic Management (W)**  
Spring. 3(4-0) P:M: (FIM 220 and ABM 435) and (ABM 332 or ABM 430) and completion of Tier I writing requirement. R: Open only to juniors or seniors. SA: FSM 429

Analysis of strategic management issues for agribusiness. Formulation of business strategy and solutions to strategic problems. Integration of operations, marketing, finance, and human resource management.

**480 Agribusiness Management in International Settings**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Not open to freshmen. Approval of department; application required.

Study and travel experience emphasizing contemporary problems affecting agricultural systems in world, national, and local communities.

**490 Independent Study in Agribusiness Management**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: (ABM 100) R: Open only to sophomores or juniors or seniors in the Agribusiness Management major. Approval of department; application required. Students are limited to a combined total of 6 credits in ABM 490 and FIM 490. SA: FSM 490

Independent supervised study of topics in agribusiness management.

**493 Professional Internship in Agribusiness Management**  
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P:M: (ABM 100) R: Open only to juniors or seniors in the Agribusiness Management major. Approval of department; application required. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, ANR 493, AEE 493, ANS 493, CSS, 493, EEP 493, FIM 493, FW 493, HRT 493, PKG 493, PLP 493, PRR 493, and RD 493.

Supervised professional experience in agribusiness management.

## **AGRICULTURAL AEC ECONOMICS**

### **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; 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) RB: (EC 805 or EC 812A) and (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.

**818 Introduction to Econometrics**  
Spring. 3(3-0) Interdepartmental with Economics; Statistics and Probability. Administered by Department of Economics. 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.

**821 Econometrics II**  
Fall. 3(3-0) Interdepartmental with Economics; Statistics and Probability. Administered by Department of Economics. 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 Economics; Statistics and Probability. Administered by Department of Economics. 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.

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

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

**830 Wetlands Law and Policy**  
Spring of odd years. 3(3-0) Interdepartmental with Resource Development; Fisheries and Wildlife; Forestry. Administered by Department of Community, Agriculture, Recreation and Resource Studies. RB: (RD 801) Prior exposure to environmental and natural resource economics, management, policy, or law. An ability to do legal and other library-based research.

Origin and development of wetlands law and policy. Wetland functions, mitigation, and banking. Legal, economic, political, and administrative perspectives. Cases, statutes and regulations.

## Agricultural Economics—AEC

- 831 Food Marketing Management**  
Spring. 3(3-0) Interdepartmental with Marketing and Supply Chain Management. Administered by Department of Marketing and Supply Chain Management. RB: (MBA 820 or MSC 805) SA: ML 831, MTA 831  
Marketing management decisions in food firms. Consumer orientation, computer technologies, food system cost reduction, global opportunities, environmental and social issues.
- 832 Environmental and Natural Resource Law**  
Fall. 3(3-0) Interdepartmental with Resource Development; Crop and Soil Sciences; 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.
- 835 Introductory Econometrics**  
Spring. 3(3-0) RB: (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.
- 838 Land Use Law**  
Spring. 3(3-0) Interdepartmental with Resource Development; Forestry; Urban Planning. Administered by Department of Community, Agriculture, Recreation and Resource Studies. RB: (RD 430) SA: RD 834  
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.
- 839 Applied Operations Research**  
Fall. 3(3-0) RB: (EC 801) SA: AEC 891B  
Linear and nonlinear programming, spatial equilibrium models, and risk programming. Applications in agribusiness management and in agricultural, environmental, and natural resource economics.
- 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) RB: (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 Agribusiness Operations Management**  
Spring. 3(3-0)  
Managerial processes for agribusiness operations control. Applications of linear programming. Budgets, simulations, and dynamic programming. Statistical process control. 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**  
Fall. 3(3-0) RB: (EC 801 and EC 805) and (AEC 835 and EC 823)  
Analysis of production models using econometrics, mathematical programming, and simulation. Systems science perspective.
- 857 Strategic Management in Agribusiness**  
Fall. 3(3-0) SA: AEC 891A  
Managerial problems faced by agribusiness firms. Strategies to interpret and respond to forces affecting the industry. Case study approach.
- 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) RB: (AEC 861) SA: AEC 891C  
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.
- 885 Leadership in Natural Resources and Environmental Management**  
Fall. 3(3-0) Interdepartmental with Fisheries and Wildlife; Forestry; Park, Recreation and Tourism Resources. Administered by Department of Fisheries and Wildlife.  
Theory and practice of leadership in natural resource and environmental management. Integration across disciplinary and jurisdictional divisions.
- 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 6 credits in all enrollments for this course. R: Open only to master's students in the Agricultural Economics major. 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 master's students in the Agricultural Economics major. Approval of department.  
Master's thesis research.
- 923 Advanced Environmental and Resource Economics**  
Fall. 3(3-0) Interdepartmental with Economics; Forestry; Park, Recreation and Tourism Resources; Resource Development. 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 Forestry; Resource Development; Park, Recreation and Tourism Resources; 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.
- 930 Dynamic Analysis in Agriculture and Natural Resources**  
Spring. 3(3-0) RB: (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. SA: AEC 991E  
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.
- 932 Information Economics and Institutions in Agriculture and Natural Resources**  
Fall. 3(3-0) RB: (AEC 800 or AEC 810 or AEC 841) and (EC 812A and EC 812B) R: Open only to Ph.D. students in the Colleges of Agriculture and Natural Resources or Business or Social Science.  
Applications to issues in agriculture, agribusiness, the food system, natural resources, and the environment. Asymmetric information, incomplete markets, principal/agent issues, transaction costs, and the design of contracts and other institutions.
- 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. SA: AEC 947  
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.

**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. SA: AEC 991F

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.

**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 colleges of Agriculture and Natural Resources, Business, and 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.

Doctoral dissertation research.

## AGRICULTURAL ENGINEERING AE

### Department of Biosystems and Agricultural Engineering College of Agriculture and Natural Resources

**150 Metal Fabrication Technology**  
Fall. 2(1-2) SA: ATM 150

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

**240 Machine Systems and Management**  
Spring. 3(2-2) P:M: (CSE 101 or CSE 131 or AT 090) SA: ATM 240

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

**252 Gasoline and Diesel Engine Technology**  
Fall. 3(2-2) SA: ATM 252

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

**254 Fluid Power Technology**  
Spring. 2(2-2) R: Open only to students in Agriculture and Natural Resources. SA: AE 054, ATM 254

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. SA: AE 061, ATM 261

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.

**490 Independent Study**  
Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. P:NM: AE 152 or ME 391 or MTH 235. R: Open only to students in the College of Agriculture and Natural Resources. Approval of department; application required.

Supervised individual student research and study in agricultural engineering.

**491 Special Topics in Agricultural Engineering**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. P:NM: AE 152 or ME 391 or MTH 235. R: Open only to students in the College of Agriculture and Natural Resources. Approval of department.

Special topics in agricultural engineering.

## AGRICULTURAL TECHNOLOGY AT

### Institute of Agricultural Technology College of Agriculture and Natural Resources

**290 Independent Study in Agricultural Technology**  
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 freshmen or sophomores in the Institute of Agricultural Technology.

Supervised individual study on experimental, theoretical or applied topics related to agricultural science and technology.

**291 Selected Topics in Agricultural Technology**  
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 freshmen or sophomores in the Institute of Agricultural Technology.

Selected topics of current interest in agricultural science and technology.

**293 Professional Internship in Agricultural Technology**  
Fall, Spring, Summer. 3 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to freshmen or sophomores in the Institute of Agricultural Technology.

Supervised professional experience in agencies, business and industry related to a student's major field of study.

## AGRICULTURAL TECHNOLOGY AND SYSTEMS MANAGEMENT ATM

### Department of Biosystems and Agricultural Engineering College of Agriculture and Natural Resources

**431 Irrigation, Drainage and Erosion Control Systems**  
Fall. 3(2-2) RB: (MTH 116 and CSS 210) R: Not open to freshmen or 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.

**890 Special Problems**  
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.

Individual study of selected topics.

**899 Master's Thesis Research**  
Fall, Spring, Summer. 1 to 10 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in Agricultural Technology and Systems Management.

Masters thesis research.

**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 Technology and Systems Management.

Doctoral dissertation research.

## AGRICULTURE AND NATURAL RESOURCES ANR

### College of Agriculture and Natural Resources

**101 Preview of Science**  
Fall. 1 credit. Interdepartmental with Natural Science; Engineering; Social Science. Administered by College of Natural Science. R: Approval of college.

Overview of natural sciences. Transitional problems. Communications and computer skills. Problem-solving skills. Diversity and ethics problems in science. Science and society.

**101A Academic and Career Decision Making**  
Fall, Spring. 2(2-0)  
Exploration of the career possibilities in agriculture, natural resources and related areas.