

- 420. The Military and American Society**
(310.) Fall. 3(3-1)
Role of the professional officer in a democratic society; socialization process within the Armed Services; political economic and social constraints upon the national defense structure.
- 421. Strategy and the Management of Conflict**
Winter. 3(3-1)
The formulation and implementation of defense policy and strategy. The bureaucratic interplay and impact of nuclear technology. An investigation of limited and insurgency warfare.
- 422. National Security Forces Policy Formulation**
(312.) Spring. 3(3-1)
Broad range of American civil-military relations and the environmental context in which defense policy is formulated. Impact of technological and international developments upon strategic preparedness.
- 499. Independent Study**
Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll for a maximum of 6 credits. Juniors and approval of instructor.
Investigation of an aspect of aerospace activities of specific interest to the student and a faculty member.

AFRICAN LANGUAGES

See Linguistics and Oriental and African Languages

AGRICULTURAL ECONOMICS

AEC

College of Agriculture and Natural Resources

- 803. Development and Relevance of Agricultural Economics**
Fall. 3(3-0)
Emergence of agricultural economics. Problems leading to change. Values and beliefs related to public issues. Interaction between professionals and decision makers. Agricultural economics in Europe and in developing nations.
- 805. Agricultural Production Economics I**
Fall. 4(4-0) FSM or PAM 340; not open to students with credit in FSM or PAM 401.
Economic principles of production. Industry supply and factor demand analysis. Management concepts and choice criteria. Interrelationship of production and consumption decisions. Welfare economics. Agricultural economics applications.
- 809. Institutions Behavior and Performance**
Fall. 3(3-0) Approval of department.
Relationships among institutional structure, behavior, and performance. Concepts of behavioral sciences useful in public policy and program analysis emphasizing interactions of preferences, incentives and institutions.

- 810. Economics of Public Choice**
Winter. 3(3-0) Approval of department. Interdepartmental with the departments of Resource Development and Economics.
Economics of alternative institutions for collective action. Emphasis on property rights and natural resources. Public goods, externalities, non-marginal change, commonwealth, income and power distribution, grants, welfare criteria and market failure.
- 811. Public Program Analysis**
Spring. Summer of odd-numbered years. 3(3-0) FSM 401 or EC 324 or approval of department. Interdepartmental with the departments of Economics and Resource Development.
Application of benefit-cost analysis to public programs of resources development. Issues and case studies in budgeting, investment criteria, pricing, externalities, and coordination.
- 830. Data Generation and Analysis**
(470.) Winter. 4(4-0) STT 421.
Organization of information systems in relation to economics of information. Use of published data and samples. Index numbers. Regression, hypothesis testing and decision making. Emphasis on social science applications.
- 831. Advanced Food Processing and Distribution Management**
Fall, Spring. 4(4-0) May re-enroll for a maximum of 8 credits. Approval of department. Interdepartmental with and administered by the Department of Marketing and Transportation Administration.
Food industry adjustment to changing social, economic and internal company environment. Managerial principles and techniques applied to food processing and distribution. Student interaction with industry, labor and government representatives.
- 833. Mathematical Programming**
Spring. 3(3-0) EC 800 or 812A, MTH 334. Interdepartmental with the departments of Economics, and Statistics and Probability.
Linear programming. Theory of linear economic models. Topics in nonlinear programming.
- 835. Introduction to Econometrics**
Fall, Spring, Summer. 3(3-0) EC 325, STT 422. Interdepartmental with and administered by the Department of Economics.
Specification, estimation and interpretation of economic models. Applications to empirical problems.
- 837. Applied Operations Research I**
Spring. 4(4-0) MTH 113 or 228. Approval of department.
Use and interpretation of operations research techniques for problems encountered by agricultural economists. Emphasis on linear programming and its variations such as transportation models, network analysis, spatial equilibrium models.
- 838. Applied Operations Research II**
Summer. 2(2-0) MTH 113 or 228, STT 422. Approval of department.
Use and interpretation of operations research techniques for problems encountered by agricultural economists. Emphasis on techniques such as Markov processes, dynamic programming cohort analysis, queuing, Monte-Carlo techniques, elementary simulation.
- 841. Industrial Organization of Agricultural Markets**
Fall. 3(3-0) Approval of department.
Market organization and evaluation of performance. Pricing and market coordination problems. Group action in agricultural markets. Role of marketing in economic development.

- 843. Commodity Market Analysis**
Winter. 3(3-0) STT 422 and FSM 401 or EC 325.
Economic forecasting in agricultural commodity markets, short run and long run. Futures markets, hedging, speculation. Plant location and size. Selected topics. Emphasis on techniques of use to firm manager.
- 851. Advanced Farm Management**
Summer. 3(2-2) FSM 430 or approval of department.
Emphasizes identification, analysis, and methods of solving problems of farm organization and operation; new technology, specialization and scale. Farm case studies, role-playing, computer games and farm business simulation.
- 860. Rural Welfare and Development Policy**
Spring. 3(3-0) Approval of department.
Analysis of policies and programs for U.S. rural economic and human development. Development strategies. Public decision processes. Growth and distribution of income and public services. Poverty and income maintenance.
- 861. Agricultural Trade Policies**
Fall of odd-numbered years; Summer of even-numbered years. 3(3-0) EC 427 or approval of department.
International trade in agricultural products, areas of competition, changes in comparative advantage, interrelationship of national and international policy, regional groupings, trade and economic development, current policy proposals.
- 862. Agriculture in Economic Development**
Winter. 3(3-0) PAM 462 or approval of department.
Agricultural and industrial sector interactions in the development process. Theories and models of the agricultural development process. Transformation of agriculture in less-developed countries.
- 865. Rural Development Administration**
Winter. 3(3-0) Approval of department.
Concepts and principles of development administration and their application in the analysis of the processes and structures through which rural development activities are formulated and implemented in less developed countries.
- 866. Public Institutions and Rural Development Administration**
Spring. 3(3-0) Approval of department.
Application of administrative tools and techniques in organizing and evaluating public institutions. Analysis of institutional effectiveness in implementing rural programs in developed and developing countries. Cross-cultural considerations emphasized.
- 868. Data Collection in Developing Countries**
Spring of even-numbered years, Summer of odd-numbered years. 3(3-0) 830 or STT 825 or approval of department.
Principles for conducting household/village level studies of production and marketing in developing countries. Preparing research proposal, methodologies for data collection, processing and analysis. Field research administration.

**Descriptions — Agricultural Economics
of
Courses**

**876. Statistical Inference in
Economics I**

Fall. 3(3-0) EC 812C or 801; STT 443 or 863; or approval of department. Interdepartmental with the departments of Economics, and Statistics and Probability and administered by the Department of Economics.

Review and extension of single-equation regression models. Properties of least-squares estimators under alternative specifications. Problems of analyzing nonexperimental data. Errors in variables, autoregressive and heteroscedastic models.

**877. Statistical Inference in
Economics II**

Winter. 3(3-0) EC 876 or approval of department. Interdepartmental with the departments of Economics, and Statistics and Probability and administered by the Department of Economics.

Specification interpretation and estimation of simultaneous equation models. Nonlinear models. Bayesian approach to estimation problems. Recent developments in econometrics.

**878. Statistical Inference in
Economics III**

Spring. 3(3-0) EC 877 or approval of department. Interdepartmental with the departments of Economics, and Statistics and Probability and administered by the Department of Economics.

Validation and application of dynamic econometric models. Bayesian approach to estimation problems. Recent developments in econometric methods and in applied econometric research.

**882. Independent and Supervised
Study**

Fall, Winter, Spring, Summer. 1 to 12 credits. May re-enroll for a maximum of 12 credits. Approval of department.

Arranged seminars initiated by faculty or students; supervised readings; individual study of special problems.

899. Research

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

**906. Agricultural Production
Economics II**

Winter. 4(4-0) 805 or FSM 401.

Resource allocation and efficiency in agriculture as related to management under conditions of both perfect and imperfect knowledge of price, institutional, technological and human change. Advanced topics.

910. Resource Economics Proseminar

Spring. 3(3-0) May re-enroll for a maximum of 9 credits. Approval of department. Interdepartmental with the departments of Forestry and Resource Development and administered by the Department of Forestry.

A seminar wherein advanced graduate students in the fields of resource economics participate with faculty in the joint conduct of a major research project in resource economics and policy.

**941. Seminar in Food Systems
Organization and Policy**

Spring of odd-number years; Summer of even-numbered years. 3(3-0) Approval of department.

Alternative methods of organization and control of food systems. Policy and program analysis. Development and presentation of position papers.

**960. Agricultural Policy in Developed
Economies**

Winter. 3(3-0) FSM 421 and one year of graduate work in social science or approval of department.

Sectoral interrelationships and the impact of economic policies relating to agriculture in advanced economies. Public decision processes. Current issues in food and fiber policy.

**962. Development Planning and
Agricultural Sector Analysis**

Spring. 3(3-0) 862; one year of graduate study in agricultural economics or economics or approval of department.

Seminar in development planning with special reference to sectoral interrelationships. Agricultural sector analysis. Project preparation and appraisal.

**972. Methodological Approaches to
Research**

Fall of even-numbered years, Summer of odd-numbered years. 3(3-0) Two terms of graduate study in social science or approval of department. Interdepartmental with the Department of Economics.

Selection, planning and conduct of research. Alternative research approaches. Role of theory, beliefs and valuations. Critical appraisal of research studies.

**990C. Mathematical Economics and
Econometrics Workshop**

Fall, Winter, Spring. 3 to 16 credits. EC 812A, 832, or approval of department. Interdepartmental with and administered by the Department of Economics.

Critical evaluation of research reports by staff and other students. Students writing doctoral dissertations in the appropriate areas are encouraged to participate in workshop and may do so while registered for 999.

999. Research

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

**Food Systems Economics and
Management** FSM

**200. Introduction to Food Systems
Management**

Fall. 4(4-0)

Organization of modern industrialized food production and distribution systems. Problems faced by managers of firms in food systems. Application of economic and management principles in the solution of these problems.

330. Food Production Management

Fall. 3(3-0)

Description and analysis of problems faced by managers of input supply, farm, and packing and handling firms. Emphasis on planning, organization, adjustment to technological change, growth and personnel management.

**335. Food Processing and Distribution
Management**

Winter. 3(3-0) 200 or MTA 300. Interdepartmental with and administered by the Department of Marketing and Transportation Administration.

Analysis of problems faced in the food processing and distribution system. Includes functional interrelationships, consumer orientation and future development.

340. Managerial Economics

Spring. 3(3-0) EC 201. Interdepartmental with and administered by Public Affairs Management.

Production, consumption decisions and their interrelation. Pricing of market and non-market goods. Effects of monetary and fiscal policies. Applications to problems in food system or community management.

370. Applied Statistics

Winter. 3(3-0) Students may not receive credit in both FSM 370 and AEC 830. One course in statistics, one course in food systems economics and management or public affairs management. Interdepartmental with and administered by Public Affairs Management.

Interpretation and use of statistical results in decision making. Sampling, index numbers, tabular analysis, trend estimation, regression models, decision theory.

**401. Production Economics and
Management**

Fall. 4(4-0) Not open to graduate students in Agricultural Economics, Economics or Resource Development. Interdepartmental with the Department of Resource Development and Public Affairs Management.

Economic principles of production. Industry supply and factor demand analysis. Management concepts and choice criteria. Interrelationships of production and consumption decisions. Welfare economics. Examples drawn from agriculture.

412. Financing the Food System

Spring. 3(3-0) 200 or EC 201.

Capital, sources and requirements in the food system. Sources and terms of credit. Credit instruments. Interest rates. Credit policy issues. Principles of financial management and real estate appraisal.

417. Land Economics

Fall, Spring. 4(4-0) Interdepartmental with the departments of Resource Development and Economics and Public Affairs Management and administered by the Department of Resource Development.

Factors affecting man's economic use of land and space resources. Input-output relationships; development, investment, and enterprise location decisions. Land markets; property rights, area planning; zoning and land use controls.

**421. Public Policy and the Food
System**

Winter. 3(3-0) 200 or EC 201, PAM 320 recommended.

Policy issues identified and analyzed in relation to performance goals of society and groups within the food system. Emphasis on price and income policies and regulations affecting the food system.

**422. Food System Managers in the
Community**

Spring. 3(3-0) 421, 430 or 439.

Examination of political and social issues affecting individual participants and businesses in the food sector.

**430. Advanced Food Production
Management**

Fall. 3(3-0) 330.

Management principles and techniques applied to food production firms including farms, input suppliers, packers and handlers. Emphasis on planning, growth, finance and decision processes. Case studies and gaming.

439. Advanced Food Processing and Distribution Management

Fall. 3(3-0) 335. *Interdepartmental with and administered by the Department of Marketing and Transportation Administration.* Managerial principles and techniques applied to food processing and distribution. Emphasizes adjustment to changing social, economic and internal company environment. Student interaction with industry, labor and government representatives. Field trips, special projects.

443. Group Action in Marketing
Spring. 3(3-0) 200.

Characteristics, problems and strategies of co-operatives, unions, bargaining groups, trade associations and other voluntary organizations. Effects of group action on farmers, marketing firms and consumers. Legal restraints and facilitation of group action.

460. Regional Economics

Winter. 4(4-0) 417 or 401 or EC 324. *Interdepartmental with the departments of Resource Development and Economics, and Public Affairs Management and administered by the Department of Resource Development.*

Forces affecting location decisions of firms, households and governments. Applications to agricultural, industrial, and regional developments.

461. Regional Economics Laboratory

Spring. 1(0-2) 460 and approval of department. *Interdepartmental with Public Affairs Management and the departments of Economics and Resource Development. Administered by the Department of Resource Development.*

Evaluation and use of analytical models designed to solve regional economic problems.

462. Agriculture and Rural Development in Developing Nations

Fall. 3(3-0) PAM 201 or EC 201; PAM 260 recommended. *Interdepartmental with Public Affairs Management and Agriculture.*

Traditional agricultural systems and the incentive environment for economic growth in rural areas. Adjustment to technological, institutional and human change. Strategies for rapid agricultural transformation.

473. Introduction to Systems Analysis

Spring. 3(3-0) MTH 111. *Interdepartmental with and administered by Public Affairs Management.*

Principles of systems analysis applied to ecological, physical, economic and social phenomena. Case studies. Interpretation and design of systems models. Systems concepts in decision making.

480. Independent and Supervised Study

Fall, Winter, Spring, Summer. 1 to 9 credits. May re-enroll for a maximum of 9 credits. Approval of department.

Public Affairs Management PAM

201. Introduction to Community Economics

Fall, Spring. 3(3-0)

Identification and analysis of problems faced by public decision makers in managing public revenues and services and governing private resource use. Impact of political and economic structures on resource use.

260. World Food, Population and Poverty

Winter. 3(3-0)

Description, analysis and alternative solutions of food, population and poverty problems, especially in relation to trade and aid programs. Special emphasis on problems of low income nations.

303. Welfare, Health and Education Policy

Fall. 3(3-0) 201 or EC 200.

Evaluation of selected welfare, health and education policies and alternatives. Role of public and private sectors. Impact of values, beliefs, costs, benefit distributions, political power and other factors on policy.

320. Economic Policy Processes I

Fall. 3(3-0) 201 or EC 201.

Analysis of processes by which public economic policy is established at various levels of government. Role of economic interests and pressures. Alternative processes for economic policy formulation. Case studies.

321. Economic Policy Processes II

Winter. 3(3-0) 320 or approval of department.

Analysis of socioeconomic forces as they affect the public decision processes for economic policy. Means of increasing effectiveness of staff persons in the decision process. Case studies.

340. Managerial Economics

Spring. 3(3-0) EC 201. *Interdepartmental with Food Systems Economics and Management.*

Production, consumption decisions and their interrelation. Pricing of market and non-market goods. Effects of monetary and fiscal policies. Applications to problems in food system or community management.

363. Economic Development of Tropical Africa

Spring. 3(3-0) EC 200 and 201, or 210. *Interdepartmental with and administered by the Department of Economics.*

African economic development in historical perspective. Analysis of contemporary economic development problems faced by tropical African countries. Alternative strategies for African economic development.

370. Applied Statistics

Winter. 3(3-0) Students may not receive credit in both PAM 370 and AEC 830. One course in statistics, one course in food systems economics and management or public affairs management. *Interdepartmental with Food Systems Economics and Management.*

Interpretation and use of statistical results in decision making. Sampling index numbers, tabular analysis, trend estimation, regression models, decision theory.

401. Production Economics and Management

Fall. 4(4-0) Not open to graduate students in Agricultural Economics, Economics or Resource Development. *Interdepartmental with the Department of Resource Development and Food Systems Economics and Management and administered by Food Systems Economics and Management.*

Economic principles of production. Industry supply and factor demand analysis. Management concepts and choice criteria. Interrelationships of production and consumption decisions. Welfare economics. Examples drawn from agriculture.

404. Social Accounts and Community Choice

Winter. 3(3-0) 303 or approval of department.

Social accounting as a framework for problem definition and measurement of policy effectiveness. Conceptualization of social accounts. Use of selected social indicators in policy formulation and decision making.

406. Public Expenditures: Theory and Policy

Fall, Spring. 4(4-0) EC 201 or 210. *Interdepartmental with and administered by the Department of Economics.*

Expenditure theory; objectives and rationale of government activity in the market system; efficiency criteria in government decision-making; planning-programming-budgeting systems and cost-benefit analysis.

417. Land Economics

Fall, Spring. 4(4-0) *Interdepartmental with the departments of Resource Development and Economics and Food Systems Economics and Management and administered by the Department of Resource Development.*

Factors affecting man's economic use of land and space resources. Input-output relationships; development, investment, and enterprise location decisions. Land markets; property rights, area planning; zoning and land use controls.

450. Law and Social Change

Fall, Spring. 3(3-0) BOA 440. *Interdepartmental with and administered by the Department of Urban and Metropolitan Studies.* Law as applied to urban and rural context of social change. A review of both formal and informal aspects of system accessibility, institutional formation, government, civil rights, and human service.

453. Women and Work: Issues and Policy Analysis

Winter. 3(3-0) 201 or EC 200 or 201 or approval of department. *Interdepartmental with the Department of Economics.*

Quantity and quality of labor force participation by women, current status and past trends. Issues analyzed include differential earnings and occupations of men and women, employment discrimination and labor legislation.

460. Regional Economics

Winter. 4(4-0) 417 or 401 or EC 324. *Interdepartmental with the departments of Resource Development and Economics and Food Systems Economics and Management and administered by the Department of Resource Development.*

Forces affecting location decisions of firms, households and governments. Applications to agricultural, industrial, and regional developments.

461. Regional Economics Laboratory

Spring. 1(0-2) 460 and approval of department. *Interdepartmental with Food Systems Management and the departments of Economics and Resource Development. Administered by the Department of Resource Development.*

Evaluation and use of analytical models designed to solve regional economic problems.

**Descriptions — Agricultural Economics
of
Courses**

**462. Agricultural and Rural
Development in Developing
Nations**

Fall. 3(3-0) 201 or EC 201; PAM 260 recommended. Interdepartmental with Agriculture and Food Systems Economics and Management and administered by Food Systems Economics and Management.

Traditional agricultural systems and the incentive environment for economic growth in rural areas. Adjustment to technological, institutional and human change. Strategies for rapid agricultural transformation.

473. Introduction to Systems Analysis

Spring. 3(3-0) MTH 111. Interdepartmental with Food Systems Economics and Management.

Principles of systems analysis applied to ecological, physical, economic and social phenomena. Case studies. Interpretation and design of systems models. Systems concepts in decision making.

**480. Independent and Supervised
Study**

Fall, Winter, Spring, Summer. 1 to 9 credits. May re-enroll for a maximum of 9 credits. Approval of department.

**AGRICULTURAL
ENGINEERING**

A E

**College of Agriculture and
Natural Resources**

**152. Introduction to Agricultural
Engineering I**

(252.) Fall. 1(1-0)

An introduction to the agricultural engineering profession with an examination of existing problems.

**153. Introduction to Agricultural
Engineering II**

(253.) Winter. 1(1-0)

Communication techniques, library use, letter and technical report writing techniques as used in the agricultural engineering profession.

**154. Introduction to Agricultural
Engineering III**

(254.) Spring. 1(1-0)

An analysis of the agricultural engineering profession with an examination of educational requirements for employment in various areas of the profession.

**200. Computers and Information
Processing in Agriculture and
Natural Resources**

Spring. 3(3-0)

Evaluation of the present and future role and application of electronic computers in the area of agriculture and natural resources.

202. Agricultural Metalworking

Fall. 3(2-2)

Principles, skills and safety for welding, soldering, brazing, cutting, bench work, metallurgy, fastening and shop tools. Maintenance metalworking for farm and agribusiness shops will be emphasized.

239. Housing Conservation

Spring. 3(3-0) Interdepartmental with the Department of Human Environment and Design.

Skills and techniques in conserving, repairing and remodeling existing housing. Structural components of housing and evaluation of housing structure.

**243. Automotive and Recreational
Engines**

Spring. 2(2-0)

The principles and maintenance of engines used in automobiles and recreational vehicles. Fuels, lubricants and emission control. Basic engineering principles are developed in a manner that requires no prior technical training.

**244. Automotive and Recreational
Engines Laboratory**

Spring. 1(0-2) 243 or concurrently.

Laboratory experiences in engine maintenance. Ignition principles and testing equipment.

**352. Physical Principles of Biological
Processes**

Fall. 3(3-0) MTH 215, PHY 289.

Basic scientific principles and engineering theory applied to biological systems and products.

**353. Physical Principles of Plant
Environment**

Winter. 3(3-0) 352.

Physical processes and properties of the biosphere as related to engineering the plant environment.

**354. Physical Principles of Animal
Environment**

Spring. 3(2-2) 352.

Interrrelationship of environmental factors and physiological responses of animals for planning, design and control of optimum environmental systems.

**355. Principles of Structures and
Machines**

Spring. 3(3-0) MMM 211.

Stress and deflection analysis of simple structures and machines. Estimation of loads and selection of materials. Course will be oriented towards applications in agricultural engineering.

402. Teaching Agricultural Mechanics

Winter of odd-numbered years. 5(2-6)

Juniors.

Teaching theory and developing skills in agricultural mechanics in secondary and vocational schools. School and farm shop planning and management. Emphasis on equipment and material selection, metallurgy, metal work and welding.

IDC. Introduction to Meteorology

For course description, see Interdisciplinary Courses.

**IDC. Introduction to Meteorology
Laboratory**

For course description, see Interdisciplinary Courses.

IDC. Microclimatology

For course description, see Interdisciplinary Courses.

462. Pollution Control

Winter of even-numbered years. 4(3-2)

352.

Application of biological, chemical, physical and engineering principles of pollution control to optimize the production and processing of food and fiber with respect to the quality of the total environment.

471. Electric Power and Control

Winter of odd-numbered years. 4(3-2)

E E 345.

Electric motors, controls and circuits; switching logic, devices and circuit design.

474. Processing Biological Products

Winter of odd-numbered years. 4(3-2)

352, M E 311.

Engineering principles of unsteady-state heat transfer, heat exchangers, drying, storage and refrigeration as applied to the processing of biological products.

**475. Introduction to Operations
Research**

Winter. 4(4-0) MTH 215, CPS 120.

Interdepartmental with Systems Science.

Methodology and basics of operations research; formulation and analysis of probabilistic models of inventory, waiting line, and reliability processes; random process simulation and network planning models.

476. Food Process Engineering

Spring of odd-numbered years. 4(3-2)

352.

Description and analysis of systems utilized in processing of foods for human consumption.

480. Special Problems

(459.) Fall, Winter, Spring, Summer.

1 to 5 credits. May re-enroll for a maximum of 5 credits. Approval of department.

Individual student research and study in: agricultural machines and tractors, waste management, food processing, structures and environment, materials processing and handling, water management, meteorology and climatology, agricultural systems analysis.

481. Soil and Water Engineering

Spring of even-numbered years. 4(3-2)

M E 332 or C E 321.

Engineering analysis, design and construction of drainage, irrigation and erosion control systems.

493. Energy Conversion Systems

Winter of even-numbered years. 4(3-2)

M E 311.

Principles of energy conversion with emphasis on the internal combustion engine. Thermodynamic analysis, performance characteristics, and power transmission.

494. Systems of Agricultural Machines

Fall. 4(3-2) 355.

Systems of machines used in field and farmstead operations. Engineering principles for machines dealing with biological materials.

**804. Agricultural Mechanization in
Developing Countries**

Spring. 3(3-0) Approval of department.

Principles of mechanical equipment selection for organized agricultural enterprises. Machinery specifications and standards, performance efficiency, cost and use, and management factors. Domestic and foreign considerations.