

**Descriptions – Aerospace Studies
of
Courses**

AEROSPACE STUDIES A S

All University

- 041. Leadership Laboratory**
Fall, Winter, Spring. 0(0-1) Approval of department. Open only to students who are not enrolled in any other Aerospace Studies course.
Basic concepts of leadership and the role of an Air Force officer; leadership development through practical experience.
- 110. Organization of the U.S. Air Force**
Fall. 1(1-1)
The doctrine and mission of the U.S. Air Force; includes its history, organization, and how it is structured for mission accomplishment. Comparison of armed services mission relationships.
- 111. U.S. Strategic Offensive and Defensive Forces**
Winter. 1(1-1)
Comparison of the missions and functions of specific Air Force commands, including employment of contemporary aerospace equipment and systems, as well as naval strategic offensive forces and army ABM systems.
- 112. U.S. General Purpose Forces**
Spring. 1(1-1)
Tactical air forces. The mission, organization and function of the Air Force support commands and separate operating agencies as well as forces of other military branches.
- 210. The Development and Employment of Aerospace Forces**
Fall. 1(1-1)
Development of flight from man's first efforts to the present. Employment of aerospace forces in war and peace.
- 211. The Development and Employment of Aerospace Forces**
Winter. 1(1-1)
Continuation of A S 210.
- 212. The Development and Employment of Aerospace Forces**
Spring. 1(1-1)
Continuation of A S 211.
- 320. U.S. Air Force Communication and Management**
Fall. 3(3-1)
Application of communication and management skills for Air Force officers.
- 321. Concepts of U.S. Air Force Leadership**
Winter. 3(3-1)
Leadership theory, functions, and practices. Applications of leadership concepts by junior officers.
- 322. U.S. Air Force Management and Leadership**
Spring. 3(3-1)
Traditional Air Force management functions and current practices. Emphasizes need for leadership and professionalism in modern officer corps.

- 420. The Military and American Society**
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 formation and implementation of defense policy and strategy. The bureaucratic interplay and impact of nuclear technology. An investigation of limited and insurgency warfare.
- 422. National Defense Policy and Military Justice**
Spring. 3(3-1)
Broad range of American civil-military relations and the environmental context in which defense policy is formulated. Military justice and the laws of war.
- 499. Independent Study**
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll 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 Germanic, Slavic, Asian and African Languages.

AGRICULTURAL ECONOMICS

AEC

College of Agriculture and Natural Resources

- 805. Agricultural Production Economics I**
Fall. 4(4-0) PAM 340 or EC 325.
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) 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**
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. Food Marketing Management**
Fall, Spring. 4(4-0) May reenroll for a maximum of 8 credits. 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 EC 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 MTH 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 MTH 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, 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 428 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.

868. Data Collection in Developing Countries
Spring of even-numbered years, Summer of odd-numbered years. 3(3-0) AEC 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.

876. Statistical Inference in Economics I
Fall. 3(3-0) EC 812A or EC 801; STT 443 or STT 863; or approval of department. Interdepartmental with the departments of Economics, and Statistics and Probability. 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. 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. 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 reenroll for a maximum of 12 credits. Approval of department.

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

884. Selected Topics
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits if different topics are taken. Approval of department.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

906. Agricultural Production Economics II
Winter. 4(4-0) AEC 805.

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 reenroll for a maximum of 9 credits. Approval of department. Interdepartmental with the departments of Forestry, and Resource Development. 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-numbered 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) AEC 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, EC 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 AEC 999.

999. Doctoral Dissertation 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) FSM 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.

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.

**Descriptions – Agricultural Economics
of
Courses**

412. Financing the Food System

Spring. 3(3-0) FSM 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 Public Affairs Management and the departments of Resource Development, and Economics. 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) FSM 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.

430. Advanced Food Production Management

Fall. 3(3-0) FSM 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) MTA 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. Cooperatives: Group Action in Marketing

Spring. 3(3-0) EC 200, Juniors, or approval of department.

Organization and operation of cooperatives. Emphasis on economics, legal foundations, and feasibility of cooperatives and other forms of group action in the U.S. food system.

460. Regional Economics

Winter. 4(4-0) RD 417 or EC 324. Interdepartmental with Public Affairs Management and the departments of Economics, and Resource Development. 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) R D 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 and Natural Resources.

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 reenroll for a maximum of 9 credits. Approval of department.

484. Selected Topics

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits if different topics are taken. 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. 4(4-0)

Description, analysis and alternative solutions of food, technology transfer, population and poverty problems, emphasizing trade and aid programs and the role of multinational firms in low income nations.

303. Welfare, Health and Education Policy

Fall. 3(3-0) PAM 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.

306. Government Programs for Workers

(456.) Winter. 4(4-0) EC 201. Interdepartmental with and administered by the Department of Economics.

Economics of selected government institutions and programs for workers. Social security, worker's compensation, Unemployment Insurance, OSHA, employment and training programs, wages and hours legislation, anti-discrimination programs.

320. Economic Policy Processes I

Fall. 3(3-0) PAM 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) PAM 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.

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 EC 201, or EC 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.

404. Social Accounts and Community Choice

Winter. 3(3-0) PAM 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 EC 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 Food Systems Economics and Management and the departments of Resource Development, and Economics. 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.

431. Law and Social Change

(450.) Fall, Spring. 3(3-0) BOA 440 or approval of department. Interdepartmental with and administered by the Department of Resource Development.

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) PAM 201 or EC 200 or EC 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) RD 417 or EC 324. Interdepartmental with Food Systems Economics and Management and the departments of Economics and Resource Development. 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) RD 460 and approval of department. Interdepartmental with Food Systems Economics and 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. Agricultural and Rural Development in Developing Nations

Fall. 3(3-0) PAM 201 or EC 201; PAM 260 recommended. Interdepartmental with Agriculture and Natural Resources, and Food Systems Economics and Management. 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 reenroll for a maximum of 9 credits. Approval of department.

484. Selected Topics

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits if different topics are taken. Approval of department.

490. Supervised Field Experience

Fall, Winter, Spring, Summer. 3 to 9 credits. May reenroll for a maximum of 9 credits. PAM Juniors, approval of department. Supervised field work in federal, state, or local government or organizations dealing with government.

**AGRICULTURAL
ENGINEERING**

A E

College of Agriculture and Natural Resources

152. Introduction to Agricultural Engineering

Fall, Spring. 1(1-0) Interdepartmental with Agricultural Engineering Technology.

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

352. Physical Principles of Biological Processes

Winter. 4(4-0) A E 353.

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

353. Physical Principles of Plant Environment

Fall. 4(4-0) CPS 120, MTH 310, CEM 152 or CEM 132.

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

354. Physical Principles of Animal Environment

Spring. 3(2-2) A E 352.

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

356. Electric Power and Control

(471.) Winter. 4(3-2) PHY 288.

Alternating current calculations; sizing conductors of single- and three-phase loads; electric motors, their control and protection; switching logic; microprocessor applications. Examples drawn from agricultural applications.

376. Food Process Engineering

(476.) Spring. 3(2-2) A E 352, C E 321.

Analysis of unit processes involved in handling, processing, and distribution of liquid and solid biological materials. Flow of liquids, heating and cooling, freezing, concentration, dehydration, and separation.

394. Systems of Agricultural Machines

(494.) Fall. 3(3-0) MMM 306.

Functional requirements and operational characteristics of agricultural machines. Engineering principles of machines dealing with soil and plant materials. Aspects of agricultural machinery management and economics.

410. Professional Ethics and Responsibilities

Spring. 1(2-0) Senior majors.

Personal and professional ethics and social responsibilities will be addressed as related to the professions of engineering and engineering technology.

461. Design of Agricultural Structures

Fall. 4(4-0) MMM 211, MMM 215.

The analysis of structural systems and the design of components and connections. Examples selected from agricultural machinery and buildings.

474. Processing Biological Products

Spring. 3(3-0) A E 352, M E 311 or CEM 361.

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

480. Special Problems

Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll 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 Conservation Engineering

Winter. 4(4-0) C E 321, A E 353.

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

482. Irrigation Design Management

Spring. 4(3-2) A E 481.

Water supply including wells, water transport, pumping and pump selection, water requirements, power supplies and irrigation equipment with emphasis on sprinkler and trickle methods and design for agricultural application.

492. Tractors and Power Transmission Systems

Winter. 4(4-0) A E 394.

Functional requirements, operational characteristics, analysis and design of tractors including power trains, hydraulics, traction, hitches, vehicle dynamics and operator comfort.

493. Power and Control Hydraulics

Winter. 4(3-2) CPS 120, C E 321.

Properties of hydraulic fluids; performance parameters of fixed and variable displacement pumps and motors; characteristics of control valves and components; analysis and design of hydraulic systems.

495. Fundamentals of Design

Spring. 3(3-0) Third-term junior majors or approval of department.

Problem identification, working media, models, procedures, and developing specifications. Selection of individual design problem for A E 496 and A E 497.

496. Design Project Laboratory

Fall, Winter, Summer. 1 to 4 credits. May reenroll for a maximum of 4 credits. A E 495.

Individual or team pursuit of the design project selected in A E 495. Activities include information expansion, developing alternatives, evaluation and selection, and concluding project.

809. Finite Element Method

Fall. 4(4-0) Approval of department. Interdepartmental with the Department of Metallurgy, Mechanics and Materials Science, and Civil Engineering. Administered by the Department of Metallurgy, Mechanics and Materials Science.

Theory and application of the finite element method to the solution of continuum type problems in heat transfer, fluid mechanics and stress analysis.