

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.

Descriptions—Agricultural Technology and Systems Management of Courses

490. Independent Study

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. P: ATM 231 or ATM 240 or BCM 311. R: Open only to majors in Agricultural Technology and Systems Management. Approval of department; application required. Supervised individual student research and study in agricultural technology and systems management.

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 graduate students in Agricultural Technology and Systems Management.

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.

AGRICULTURE AND NATURAL RESOURCES ANR

College of Agriculture and Natural Resources

101. Preview of Science

Fall. 1(1-0) Interdepartmental with Natural Science; Engineering; and Social Science. Administered by 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.

110. New Student Seminar: Issues and Ideas in Agriculture and Natural Resources

Fall. 2(1-2) R: Open only to freshmen or sophomores or juniors in the College of Agriculture and Natural Resources. Exploration of broad issues in agriculture and natural resources. Personal and professional development through discussion and interactive experiences.

192. Environmental Issues Seminar

Fall, Spring. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Natural Science; Engineering; Social Science; and Communication Arts and Sciences. Administered by Natural Science. R: Open only to students in the College of Agriculture and Natural Resources or College of Engineering or College of Natural Science or College of Communication Arts and Sciences or College of Social Science. Approval of college. Environmental issues and problems explored from a variety of perspectives, including legal, scientific, historical, political, socio-economic, and technical points of view.

210. Foundations in Connected Learning

Spring. 3(2-2) R: Approval of college. Active, self-directed, and reflective learning associated with agriculture and natural resource issues, self and social development, and ethical choice making. Development of a learning plan and design of a learning portfolio. Individual and group presentations. Field trips required.

289. Civilizations, Food Crops and the Environment

Fall, Spring. 3(3-0) Interdepartmental with Crop and Soil Sciences. Role of the major food crops in the survival of civilizations and cultures from the past to the present, and the resulting environmental impacts. SA: TCC 289

310. Connected Learning Seminar I

Fall, Spring, Summer. 2(2-0) P: (ANR 210) Learner-directed critical analysis of contemporary issues in agriculture and natural resources. Communication of outcomes to professional community. Collaborative learning integrated with individual experiences.

311. Connected Learning Seminar II

Fall, Spring, Summer. 1(1-0) P: (ANR 310) Transition to a professional career through advanced analysis and presentation of contemporary issues in agriculture and natural resources.

392. Agriculture and Natural Resources Seminar

Spring. 1(2-0) R: Not open to freshmen and sophomores. Current agricultural, natural resources and environmental problems and solutions. Discussion leaders from various disciplines.

410. Connected Learning Application

Spring. 3(1-4) P: (ANR 311) Integration, synthesis, and analysis of structured experiences in agriculture and natural resources. Personal and interpersonal development, personal and professional integrity, communication competence, and critical and reflective thinking.

475. International Studies in Agriculture and Natural Resources

Fall, Spring, Summer. 2 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of college; application required. Study-travel experience emphasizing contemporary problems affecting agriculture and natural resources in the world, national and local communities. Case studies and interviews with officials, community leaders and leading professionals.

489. Integrated Approaches to Agriculture and Natural Resources Problems (W)

Fall, Spring. 3(2-2) P: MTH 110 or MTH 116; EC 201 or EC 202. R: Open only to seniors in the College of Agriculture and Natural Resources. Completion of Tier I writing requirement. Holistic solutions to resource management and allocation: an integrated, multidisciplinary team approach to case study problems.

490. Independent Study in Agriculture and Natural Resources

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 sophomores or juniors or seniors or graduate students in the College of Agriculture and Natural Resources. Supervised individual study in topics related to agriculture and natural resources.

491. Selected Topics

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Not open to freshmen and sophomores. Special topics in agriculture and natural resources.

493. Professional Internship in Agriculture and Natural Resources

Fall, Spring, Summer. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors and seniors in the College of Agriculture and Natural Resources. 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. Supervised professional experiences in agencies and businesses related to a student's major field of study.

AMERICAN STUDIES AMS

Department of American Studies College of Arts and Letters

250. American Art

Spring. 3(3-0) Interdepartmental with History of Art. Administered by History of Art. Major developments and themes in non-indigenous American art (painting, sculpture, architecture, material culture) from its colonial origins through the 20th century.

332. Technology and Culture

Fall. 4(4-0) Interdepartmental with Lyman Briggs School. Administered by Lyman Briggs School. P: Completion of Tier I writing requirement. R: Open only to juniors or seniors in the American Studies major in Lyman Briggs School. History of technology with special emphasis on the interaction of technical innovation and other elements of culture.

335. The Natural Environment: Perceptions and Practices

Spring. 4(4-0) Interdepartmental with Lyman Briggs School. Administered by Lyman Briggs School. P: Completion of Tier I writing requirement. R: Open only to sophomores or juniors or seniors in the American Studies major or in Lyman Briggs School. American attitudes toward the natural environment and related public and private institutions.