

Management and administered by the Resource Development Department.
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.

460. Location Analysis
Winter. 4(4-0) 417 or 401 or EC 324.
Interdepartmental with the Resource Development and Economics Departments, and Food Systems Economics and Management and administered by the Resource Development Department.
Forces affecting location decisions of firms, households and governments. Applications to agricultural, industrial, and regional developments.

462. Rural Transformation in Developing Societies
(AEC 462.) Fall. 3(3-0) 201 or EC 201; 260 recommended. Interdepartmental with Agriculture and 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**

202. Physical Principles of Mechanical Processes
Fall, Spring. 3(1-4)
Theory and skills in metallurgy, heat treating, cold metal, sheet metal, plumbing, arc and oxy-acetylene welding and machine operations.

220. Engineering Principles Applied to Agriculture
Winter. 4(3-2) MTH 108.
Physical principles and their application to agricultural production, distribution and processing.

252. Introduction to Agricultural Engineering I
Fall. 1(1-0)
An introduction to the Agricultural Engineering profession with an examination of existing problems.

253. Introduction to Agricultural Engineering II
Winter. 1(1-0)
Communication techniques, library use, letter and technical report writing techniques as used in the Agricultural Engineering profession.

254. Introduction to Agricultural Engineering III
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.

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, SLS 210.

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.

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

355. Principles of Structures and Machines
Winter. 3(2-2) MMM 211.

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

402. Teaching Agricultural Mechanics
Winter, Spring. 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.

416. Agricultural Structures
Fall, Spring. 4(3-2) Juniors.

Functional planning and principles of environmental control, cost estimation, structural component analysis and properties of building materials.

421. Electric Power
Fall, Spring. 4(3-2) 220.

Application of electric energy to production and living; selection, installation, operation and control of electrical equipment.

423. Principles of Processing Equipment
Winter. 3(2-2) 220.

Principles of equipment used in the processing and storage of biological products.

425. Farmstead Materials Handling
Spring. 3(2-2) Juniors.

Systems and equipment for handling grain, hay, fertilizer, water and wastes on the farm. Systems design and evaluation.

431. Principles of Irrigation, Drainage and Erosion Control
Spring. 4(3-2) SLS 210.

Use of surveying, design, construction and cost estimates of drainage, irrigation and water control systems.

432. Introduction to Meteorology
For course description, see Interdisciplinary Courses.

433. Introductory Meteorology Laboratory
For course description, see Interdisciplinary Courses.

435. Microclimatology
For course description, see Interdisciplinary Courses.

437. Principles of Food Engineering
Winter. 5(5-0) 220.

Principles and use of electricity, steam, refrigeration and hydraulics in food plants. Emphasis will be placed on specialized processing equipment, their design features, materials of construction and automatic control.

443. Internal Combustion Engines
Fall, Spring. 3(2-2) 220.

Introduction to spark ignition and compression ignition engines with emphasis on principles of operation, combustion, fuels, lubricants and engine performance.

444. Agricultural Production Machinery
Spring. 3(2-2) 220.

Basic principles of agricultural machines. Selection, care and operation of agricultural machinery for obtaining optimum conditions for crop production.

459. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 5 credits. Approval of department.

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
Fall. 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.

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
Spring. 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) 353.

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.

805. Environmental Measurements

Fall. 3(2-2)

Methods and techniques for accurate measurement and interpretation of environmental parameters. Temperature, humidity, wind and air flow characteristics, radiation, light intensity, gaseous and particulate concentrations in atmospheric microclimates will be discussed.

811. Technical Problems

Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 9 credits.

812. Bio-Processing Engineering

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

Topics will be presented pertaining to thermodynamics, heat and mass transfer, thermal processing, fluid flow, dehydration and freeze drying of biological products or biological processes.

814. Physical Properties of Agricultural Products

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

Physical and mechanical behavior of fruits and vegetables, forages, grains and other agricultural products under constant and dynamic loading. Related to design parameters for production, handling and processing machinery.

815. Instrumentation for Agricultural Engineering Research

Fall. 3(3-0)

Theory, method and techniques of measuring temperature, pressure, flow, humidity, and moisture for biological materials. Associated recording and indicating equipment.

820. Research Methods in Agricultural Engineering

Fall. 1(1-0)

Discussion of procedures for initiating, developing, carrying out, and completing research projects.

822. Seminar

Spring. 1(1-0)

840. Advanced Power and Machinery

Spring. 3(2-2) 493, 494.

Analysis of agricultural machine components and systems. Emphasis on hydraulic power transmission, controls, and management of machinery systems.

899. Research

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

990. Advanced Topics in Agricultural Engineering

Fall, Winter, Spring. 3(3-0) May re-enroll for a maximum of 9 credits. Approval of department.

New developments in agricultural engineering. Subjects to be covered include atmospheric turbulence, optimization of agricultural systems, measurement systems, food engineering, and agricultural rheology.

999. Research

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

AGRICULTURE

AG

College of Agriculture and Natural Resources

401. Agriculture and Natural Resources Communications

Winter, Spring. 3(2-2) JRN 201 or other writing course and approval of department.

Techniques, strategies and practices in development of agricultural and natural resources information programs. Including writing, public relations, TV and radio production for specialized and general audiences.

402. Agriculture and Natural Resources Communications Internship

Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 6 credits. 401, approval of college.

Internship with professionals in communications field with emphasis on student's areas of interest—writing, radio, TV, publications, etc.

450. United States Agriculture for Overseas Students

Fall. 3(3-0) Advanced undergraduate or graduate students from countries other than the United States or Canada.

Orientation course for overseas students. Development of United States agriculture. Institutions serving agriculture with emphasis on Land Grant University system. Scientific developments and their impact on agriculture. Field trips.

462. Rural Transformation in Developing Societies

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

475. International Studies in Agriculture and Natural Resources

Summer. 3 to 9 credits. Approval of the college. Interdepartmental with Natural Resources.

Study-travel experience emphasizing contemporary problems affecting agriculture in the world, national, and local communities. Field trips, case studies, interviews with leading experts, government officials, community leaders. Supervised individual study.

488. The Impact of Animal Resource Management Upon the World's Developing Nations

Winter. 3(4-0)

For course description, see Interdisciplinary Courses.

865. Rural Development Administration I

(802.) Winter. 3(2-2) Approval of department. Interdepartmental with and administered by the Department of Agricultural Economics.

Administrative concepts and their application in the analysis of the processes and structures through which agricultural and rural development activities are formulated and implemented in less developed countries.

866. Rural Development Administration II

(803.) Spring. 3(3-0) 865. Interdepartmental with and administered by the Department of Agricultural Economics.

Comparative analysis of major cases of intensive, purposeful change in less developed countries with emphasis on economic, administrative, political and other relevant factors which help explain program or policy effectiveness.

880. Soils and Land Use in Tropical and Subtropical Regions

Spring. 3(3-0) Approval of department. Interdepartmental with and administered by Soil Sciences.

Problem oriented studies of soils and land use in the tropics and subtropics in relation to their genesis, morphology, taxonomy, and management.

AMERICAN STUDIES

AMS

College of Arts and Letters

301. Issues in American Civilization

Fall, Winter, Spring. 3(3-0) May re-enroll for a maximum of 9 credits. ATL 113. Not applicable to major requirements.

Selected issues in American life past and present, with materials drawn from such disciplines as history, social sciences, philosophy, literature and the arts. Topics vary.

410. Perspectives in American Studies

Fall. 3 credits. Juniors in American Studies or approval of American Studies Committee.

Methods and significant works, for majors in the American Studies program. Offered by members of the relevant departments.

411. Problems in American Civilization

Winter, Spring. 3 credits. Majors must re-enroll for a maximum of 6 credits. 410, Juniors in American Studies or approval of American Studies Committee.

Seminar approach to selected problems in American life employing the objectives and approaches of interdisciplinary studies. Offered by members of relevant departments, for majors in the American Studies program.

AMERICAN THOUGHT AND LANGUAGE

ATL

University College

Alternative approaches or tracks are offered on an optional basis all of which meet the course objectives of 111, 112, 113. These are described briefly below and are designated by letters which are used as part of the course number for registration. No student may receive credit for more than one track within a course (111, 112, 113).

101A. Comprehensive English

(I S 095; 100.) Fall, Winter, Spring, Summer. 3(4-0) No student may receive credit in both 101A and 101B. Admission by examination or approval of department.

Instruction and practice in reading and writing. Emphasis upon mastery of fundamental skills needed for a variety of reading and writing assignments.