490. Supervised Field Experience
Fall. Winter. Spring. Summer. 3 to 9 credits. May be repeated for a maximum of 9 credits. PAM Juniors, approval of department. Supervised field work in rural, urban, or federal government agencies dealing with agricultural engineering.
474. Processing Biological Products
Winter. 3(3-0) A E 352, M E 311 or CEM 361.
Engineering principles of steady 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 310, CPS 130. Interdepartmental with Systems Science.
Methodology and basic of operations research; formulation and analysis of probabilistic models of inventory, waiting line, and reliability processes; random process simulation and network planning models.

480. Special Problems
(459.) 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 Waste Engineering
Spring. 4(4-0). CE 321, A E 353.
Engineering analysis, design and construction of drainage, irrigation and erosion control systems.

492. Tractors and Power Transmission Systems
Fall. 4(4-0) A E 394, MMP 306.
Functional requirements, operational characteristics, analysis and design of tractors including power trains, hydraulics, traction, hitches, vehicle dynamics and operator comfort.

495. Fundamentals of Design
Fall. 3(3-0) Agricultural Engineering.
Senior. 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 Investigation Laboratory
Winter. 2(0-4) A E 495.
Individual or team pursuit of a design project. Project log and completion of preliminary specifications.

497. Design Project Completion Laboratory
Spring. 3(0-4) A E 495.
Completion of design project including submission of final design report.

498. Agricultural Mechanization in Developing Countries
Spring 3(3-0) Approval of department.

499. Environmental Measurements
Fall. 4(3-3)
Methods and techniques for accurate measurement and interpretation of environmental parameters. Temperature, humidity, wind and air flow characteristics, radiation, light intensity, gases and particulate concentrations in atmospheric microclimates will be discussed.

506. Analysis of Agricultural Systems
Spring. 3(0-4) SYS 810.
Identification and definition of systems problems in agriculture. Model formulation and estimation. Several models of current interest are considered.

507. Man-Machine Relationships
Fall. 3(3-0) Approval of department.
Analysis of machine design, operation and working environment in relation to human limitations and capabilities. Analysis of procedures used to develop maximum compatibility between man and machine.

509. Finite Element Method
Fall. 4(4-0) Approval of department.
Interdepartmental with the Department of Metallurgy, Mechanics and Materials Science, and Civil Engineering and 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.

510. 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.

514. 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.

515. Instrumentation for Agricultural Engineering Research
Fall. 3(0-4)
Theory, method and techniques of measuring temperature, pressure, flow, humidity, and moisture for biological materials. Associated recording and indicating equipment.

520. Research Methods in Agricultural Engineering
Fall. 1(1-0)
Discussion of procedures for initiating, developing, carrying out, and completing research projects.

522. Seminar
Spring. 1(1-0)

540. Advanced Power and Machinery
Spring. 3(2-2) A E 394, A E 492.
Analysis of agricultural machine components and systems. Emphasis on hydraulic power transmission, controls, and management of machinery systems.

580. Special Problems
(811.) Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 9 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.
416. Light Structural Systems
(A E 416.) Fall. 4(4-4) PHY 237 or approval of department.
Functional planning of animal structures, properties of building materials and selecting building components to satisfy requirements of light structures.

421. Electrical Energy Utilization
(A E 421.) Spring. 4(3-2) PHY 238 or approval of department.
Efficient utilization of electrical energy, selection, operation and control of electrical equipment. Design of electrical systems.

431. Irrigation, Drainage and Erosion Control Systems
(A E 431.) Spring. 4(3-2) CSS 210 or approval of department.
Use of surveying, design, construction and cost estimates of drainage irrigation and water control systems.

443. Machinery and Tractor Systems
(A E 443.) Fall, Spring. 4(3-2) A E 243 or approval of department.
Characteristics of basic agricultural field machinery. Diesel engine, fuel injection and combustion chamber characteristics. Torque and power transmission, tractor stability and implement hitching.

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, architectural systems analysis.

Building Construction

B C

200. Dynamics of American Housing
Fall, Winter, Spring, Summer. 3(3-0)
Impact of housing on the economic and social welfare of America. Analysis of the residential building industry and its problems in providing adequate housing.

312. Structural Design
Fall. 4(4-4) B C 200 or approval of department.
Consideration of structural design systems as used in light construction.

412. Housing Utilities Design
Winter. 4(4-4)
Design and planning for mechanical and electrical utilities in housing.

413. Residential Construction Systems
Spring. 4(3-2) B C 312 or approval of department.
Analysis of the primary construction systems employed in the residential building industry, especially the economic and social aspects in meeting the housing goals of the U. S.

415. Building Materials
Spring. 4(4-0) B C 312 or approval of department.
Properties of building materials pertinent to their application and performance in service.

Agriculture and Natural Resources

College of Agriculture and Natural Resources

124A. Introduction to Careers in Vocational and Practical Arts Education—Agriculture
Fall. 2(1-2) Interdepartmental with and administered by the College of Education.

275. Exploring International Agriculture
Spring. 3(3-0) Interdepartmental with Natural Resources.
Exploration of overseas assignments with international agencies, potential world food availabilities and potentialities; special problems of the tropics compared with those in temperate regions.

341. Energy in the Food System
Winter. 3(3-0) Juniors or approval of department. Interdepartmental with and administered by Agricultural Engineering Technology.

350. Leadership Development for Agriculture and Natural Resources
Winter, Spring. 3(3-0) May reenroll for a maximum of 6 credits. Approval of department. Interdepartmental with Natural Resources.

399. Agriculture Internship
Fall, Winter, Spring, Summer. Zero to 10 credits. (10 credits.) See page A-2, item 3.) Juniors and approval of department. Interdepartmental with Natural Resources.
Professionalized experiences in a student’s major. Supervision and evaluation by faculty and cooperating agencies.

401. Agriculture and Natural Resources Communications
Fall, Winter, Spring. 2(2-2) JRN 261 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 Seminar
Spring. 2(2-0) Interdepartmental with Natural Resources.
Current agricultural, natural resources, and environmental problems and solutions as presented by discussion leaders from various disciplines, arranged by undergraduate students.

444. Pest Management I: Systems Management for Plant Protection
(437.) Fall. 4(3-2) FSM 200 or EC 201. Interdepartmental and administered by the College of Natural Science.
Designed to integrate knowledge and improve ability in arriving at pest management decisions of varying complexity involving the fields of agronomy, wildlife, horticulture, entomology, and plant pathology.

445. Pest Management II: Pesticide Chemistry and Application Systems for Plant Protection
(435.) Winter, 5(3-4) CEM 132. Interdepartmental with and administered by the College of Natural Science.
A broad overview of pesticide chemistry, efficient usage, environmental fate, legislation and application techniques.

446. Pest Management III: Biological Systems for Plant Protection
(436.) Spring. 3(3-0) ENT 430, BOT 405, HRT 402 or CSS 402. Interdepartmental with and administered by the College of Natural Science.
Management of plant pests utilizing host resistance, cultural practices, legislation, and biological systems.