Agricultural Engineering

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 253.
Basic scientific principles and engineering theory applied to biological systems and products.

453. Women and Work: Issues and Policy Analysis
WINTER. 3(3-0) PAM 301 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 differences in earnings and occupations of men and women, employment discrimination and labor legislation.

460. Regional Economics
WINTER. 4(4-0) R D 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(2-0) R D 480 and approval of department. Interdepartmental with Food Systems Economics and Management and the department 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 Agricultural 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. 1 to 9 credits. May reenroll for a maximum of 9 credits. Approval of department.

484. Selected Topics
FALL, WINTER, SPRING. 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. 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

474. Processing Biological Products
SPRING. 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.

480. Special Problems
FALL, WINTER, SPRING. 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, environment, materials processing and handling, heater management, meteorology and climatology, agricultural systems analysis.

481. Soil and Water Conservation Engineering
WINTER. 4(5-0) C E 331, A E 353.
Engineering analysis, design and construction of drainage, irrigation and erosion control systems.

482. Irrigation Design Management
SPRING. 3(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
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, SPRING. 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.

509. 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.
Agricultural Engineering — Descriptions of Courses

329. Unit Operation and Food Processing
Fall. 4(2-2) PHY 237, MTH 100. Interdepartmental with Food Science.
Engineering concepts related to the unit operations found in the food industry. Fluid mechanics, heat transfer, and processes including psychrometrics and refrigeration.

340. Principles of Agricultural Tractors and Machinery
(AET 323.) Fall. 4(2-2) MTH 100 or MTH 111; CPS 115 or CPS 120.
Principles, analysis, performance, and operating characteristics of agricultural tractors and machinery for tillage, planting, cultivating, and harvesting field crops.

341. Energy in the Food System
Winter. 3(3-0) Juniors or approval of department. Interdepartmental with Agriculture and Natural Resources.

410. Teaching Agricultural Mechanics
(AE 402.) Spring. 3(2-3) Approval of department.
Teaching techniques in agricultural machinery for secondary and vocational schools. Shop planning and management.

415. Agricultural and Natural Resources Safety
Winter. 3(3-0) Juniors.
Principles of safety problem solving. Accident causation and prevention; laws and regulations; machinery, electrical, chemical, livestock, shop and fire safety; security; and safety program development.

421. Electrical Energy Utilization
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.

426. Production and Storage Systems
(AET 416.) Fall. 4(4-0) AET 311, BCM 322.
Layout of buildings and material handling systems; interior environment and its control; requirements for livestock production and crop storage.

431. Irrigation, Drainage and Erosion Control Systems
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.

436. Microclimatology
Winter. 3(3-0) MTH 108; GEO 351 recommended. Interdepartmental with the Department of Geography.
Physical environment in the lower few hundred meters of the atmosphere and within the biosphere.
Descriptions — Agricultural Engineering of Courses

440. Agricultural Tractor and Machinery Systems (AET 435) Winter, 4(4-0) AET 340; AET 311 or FEM 473.
Management and analysis of agricultural tractor and machinery systems. Tractor - implement matching. Economics of operation and ownership. Interaction with weather conditions, farming types and techniques, crop rotation, labor and energy.

450. 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 machinery and tractors, waste management, food processing, structures and environment, materials processing and handling, water management, meteorology and climatology, agricultural systems analysis.

504. Agricultural Mechanization in Developing Countries Spring. 3(3-0) Approval of department.
Appropriate agricultural mechanization with emphasis on hand, animal, and mechanical equipment for the smaller farms. Machine selection, local manufacturing, public and private costs, ownership patterns, increasing production and decreasing post production losses.

506. Analysis of Agricultural Systems Spring. 3(3-0) AET 440.
Identification and development of systems problems in agriculture. Model formulation and estimation. Several models of current interest are considered.

507. Human Factors Engineering (A E 807) 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 achieve maximum compatibility between people and machine.

508. Environmental Measurements (AET 805) Spring. 4(3-3) Approval of department. Interdepartmental with the Department of Geography.
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 microenvironments will be discussed.

520. Research Methods Fall. 1(1-0) Approval of department. Interdepartmental with Building Construction Management.
Procedures for initiating, developing, carrying out and completing research projects.

522. Seminar Spring. 1(1-0) Approval of department.

530. Special Problems Fall. Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 4 credits. Approval of department. Individual study or research on selected topics.

590. Advanced Topics in Agricultural Engineering Technology Fall, Winter, Spring. 3(3-0) May reenroll for a maximum of 12 credits if different topics are taken. Approval of department.
New developments in agricultural engineering technology.

880. Special Problems Spring. 3(3-0) Approval of department.
Procedures for initiating, developing, carrying out and completing research projects.

Building Construction Management

200. American Housing and Building Industry (B C 200) Fall. Winter, Spring, Summer. 3(3-0) Residential and light commercial construction industry in America. Impact of government, finance, zoning ordinances, codes, aesthetics, construction technology, demographics, energy and society.

215. Architectural Drafting I (B C 215) Fall. Summer. 4(2-0)
Residential design including site plans, floor plans, foundation plans, elevations, sections and details.

216. Architectural Drafting II (B C 216) Winter. 4(2-4)
Light commercial design including site plans, floor plans, foundation plans, elevations, sections and details, barrier free accessibility.

239. Housing Conservation (AET 239, B C 239) 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.

301. Energy Conservation Systems for Buildings (B C 301) Winter. 3(3-0) BCM 215, MTH 109 or MTH 111 or approval of department.
Solar energy, earth sheltered and energy conservation systems for buildings will be analyzed for operation, optimum size, construction, performance, climate, cost-effectiveness and human comfort for northern climates.

312. Structural Design (B C 312) Winter. 4(5-0) PHY 237, BCM 215 or approval of department. Interdepartmental with Agricultural Engineering Technology.
Concepts of structural mechanics, material strengths and section properties are developed and applied to design using wood, steel and concrete.

313. Construction Systems (B C 313) Spring. 4(3-2) BCM 200, BCM 215, CPS 115.
Primary construction systems employed in the residential and light commercial construction industry. Interrelationships between planning, processes, costs and management.

412. Utilities Design (B C 412) Fall. 4(4-0) PHY 238, BCM 215 or approval of department.
Design and planning for mechanical and electrical utilities in residential and light commercial construction.

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

416. Building Costs (B C 416) Winter. 4(2-4) BCM 312 or concurrently.
Methods of cost estimating. Effects of codes and production practices on costs.

417. Construction Management Finance (B C 417) Winter. 4(4-0)
Financing methods for the construction, rehabilitation, and purchase of real estate.

418. Special Problems (B C 418) Fall. Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 11 credits. Written approval of department. Special problems in the areas of acquisition and development of residential land, design, construction technology, building materials, finance, marketing, construction management and land use codes and regulations.

419. Senior Seminar (B C 419) Fall. 1(1-0) Senior majors.
Professional practices, business ethics, market trends, and structure of the construction industry.

420. Construction Management (B C 420) Spring. 4(4-0) Senior majors.
Systems management techniques for building organizations, development, operations, planning, scheduling and control, and administrative procedures.

421. Modular Construction (B C 421) Spring. 3(3-0) Senior majors.
Methods and problems of design, construction, management and marketing of pre-fabricated buildings.

422. Innovation Management (B C 422) Fall. 3(3-0) Senior majors.
Innovation management techniques for building organizations, development, operations, planning, scheduling and control, and administrative procedures.

480. Special Problems (B C 480) Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 5 credits. Approval of department.
Individual student research and study in land acquisition and development, design, construction, management, finance, marketing, and structural analysis.

590. Advanced Topics (B C 590) Fall. Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits if different topics are taken. Approval of department.
Topics will be selected from: computer methods in construction management, advanced construction management, optimization techniques, solar energy buildings, advanced estimating, numerical structural analysis, new construction techniques and materials.

899. Master's Thesis Research (B C 899) Fall, Winter, Spring. 3(3-0) Variable credit. Approval of department.