

# Course Catalog - Spring 2007

## Agricultural and Biological Engineering

### 100 **Intro to Agr Engineering** Credit: 1 hours.

Introduction to the engineering profession with career opportunities in the agricultural engineering discipline. Interactive class activities include concepts necessary for becoming a successful engineer including time management, design concepts, ethics, and teambuilding. Students become familiar with laboratories, computer facilities, internships and other opportunities that are available to agricultural engineering students. A team design experience is included. Class emphasis on technical communication and problem-solving skills as well as career planning. Approved for both letter and S/U grading.

### 199 **Undergraduate Open Seminar** Credit: 1 to 5 hours.

Experimental course on a special topic in Agricultural Engineering. May be repeated to a maximum of 12 hours.

### 221 **Agr & Bio Engineering I** Credit: 4 hours.

Introduction to engineering methods used in the design and management of agricultural, biological and environmental systems. Topics covered include the hydrologic cycle, soil-water properties and relationships, water runoff, surveying, soil erosion, water management, engine power, fluid power, traction and weight transfer, and off-road vehicle systems. Prerequisite: One of MATH 220, MATH 221, MATH 234.

### 222 **Agr & Bio Engineering II** Credit: 4 hours.

Introduction to biomaterials and bioprocess design. Includes structure and composition of biomaterials, mass balances, force-deformation of biomaterials and non-Newtonian fluid flow. Principles of environmental control for biological structures, psychrometrics, mass and heat transfer through buildings, and ventilation requirements. Prerequisite: One of MATH 220, MATH 221, MATH 234.

### 361 **Princ of Off-Road Machines** Credit: 3 hours.

Design and development concepts of agricultural and industrial machines; analysis and synthesis of tillage, planting, harvesting, chemical application, material handling mechanisms, and precision farming tools. Includes laboratory. Prerequisite: ABE 221 and TAM 212.

### 374 **Env Control for Bio Buildings** Credit: 3 hours.

Application of bioenvironmental engineering principles to control agricultural building environments. Psychrometrics, room air distribution, fluids, heat transfer, ventilation equipment, environmental physiology and design topics. Includes laboratory. Prerequisite: ABE 222.

### 396 **UG Honors Research or Thesis** Credit: 1 to 4 hours.

Individual research, special problems, thesis, development and/or design work for James Scholars under the direction of the honors advisor. May be repeated to a maximum of 8 hours. Prerequisite: Consent of instructor.

### 397 **Independent Study** Credit: 1 to 4 hours.

Individual research, special problems, thesis, development and/or design work under the supervision of a member of the faculty. May be repeated to a maximum of 8 hours.

### 398 **Special Topics** Credit: 1 to 3 hours.

Group discussion or an experimental course on a special topic in agricultural engineering. May be repeated to a maximum of 12 hours.

### 420 **Kinem and Dynm of Mechanl Sys** Credit: 3 hours.

Same as ME 440. See ME 440.

### 425 **Eng Measurement Systems** Credit: 4 hours.

Emphasizes fundamental and integrated skills in designing engineering measurement systems and performing engineering measurements. Main topics include design of engineering measurement systems, principles of

sensors, signal conditioning, computer data acquisition, engineering test design, and data analysis. Includes laboratory. Credit is not given for both ABE 425 and ME 360. Prerequisite: ECE 205.

**426 Applied Machine Vision** Credit: 3 hours.

The convergence of computer imaging, pattern recognition, and artificial intelligence have made it possible to quantify complex physical phenomena that commonly occur in food and agricultural systems. This course introduces students to basic principles required for machine vision applications. Hardware and software aspects for machine vision applications will be studied. Includes laboratory. Prerequisite: CS 101 and MATH 225.

**430 Project Management** Credit: 2 hours.

Engineering team effectiveness; project definition; assessing related technologies; marketing and business planning related to engineering; budgeting and financial analyses of engineering projects; safety, ethics and environmental considerations; intellectual property; engineering proposal presentation. Same as TSM 430.

**436 Renewable Energy Systems** Credit: 3 or 4 hours.

A comprehensive overview of renewable energy sources and applications, including solar, geothermal, wind, and biomass. Examines the environmental consequences of energy conversion including how renewable energy can reduce air pollution and global climate change. A capstone group project encompasses the design of a system for collecting and converting renewable energy into thermal or electrical energy. Same as TSM 436. 3 undergraduate hours. 4 graduate hours. Prerequisite: PHYS 211.

**440 Applied Statistical Methods I** Credit: 4 hours.

Same as ANSC 440, CPSC 440, FSHN 440, and NRES 440. See CPSC 440.

**445 Statistical Methods** Credit: 4 hours.

Same as ANSC 445, and NRES 445. See ANSC 445.

**455 Erosion and Sediment Control** Credit: 2 hours.

Processes, estimation, and control of soil erosion by water, wind and resultant sedimentation. Upland, in-channel, urban, agricultural, disturbed (both military training and mining), and forested environments are discussed. Site planning and design constitute a capstone laboratory exercise. Same as CEE 455 and TSM 455. 2 undergraduate hours. 2 graduate hours. Prerequisite: CEE 350 or NRES 401; CEE 380 or NRES 201.

**456 Land and Water Resources Eng** Credit: 3 or 4 hours.

Hydrology, hydraulics, design, construction and cost estimating of structures for the conservation and quality control of soil and water resources; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality control of soil and water for agriculture. Includes laboratory. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: Credit or concurrent registration in TAM 335.

**459 Drainage and Water Management** Credit: 3 or 4 hours.

Design, construction, performance, and maintenance of agricultural drainage systems to meet both production and water quality objectives. Modeling drainage systems. Principles of conservation drainage. Includes laboratory. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: Credit or concurrent registration in TAM 335.

**466 Engineering Off-Road Vehicles** Credit: 3 hours.

Engineering aspects of design and application of off-road vehicles for farm and construction use; thermodynamics of engines; measurement of power and efficiencies; power transmission and traction; chassis mechanics; and operator environment. Includes laboratory. Prerequisite: ME 300.

**469 Industry-Linked Design Project** Credit: 4 hours.

Emphasizes open-ended design projects which utilize principles of design, engineering analysis and functional operation of engineering systems. Projects are submitted and sponsored by industrial clients, design team developed, concepts visualized, alternatives evaluated and geometry created using CAD systems. Emphases on communication skills, technical writing, and interaction with industry representatives. Students operate in a team-based industrial environment with "real life" industrial projects. Prerequisite: One of ABE 361, CHBE 421, TAM 335; or credit or concurrent registration in ME 370.

**476 Indoor Air Quality Engineering** Credit: 3 hours.

Principles and applications of indoor air quality. Topics include particle mechanics, gas kinetics, air quality sampling principles and techniques, air cleaning technologies (i.e. filters, cyclones, electrostatic precipitation) for indoor environments, and ventilation effectiveness. Includes laboratory. Prerequisite: PHYS 213, MATH 385, and TAM 335.

**479 Design of Agr & Bio Structures** Credit: 3 hours.

Complete design of light frame building components including timber, concrete, beams and connectors. Design of heating and ventilation systems. Includes laboratory.

**482 Package Engineering** Credit: 3 hours.

Same as FSHN 469. See FSHN 469.

**483 Eng Properties of Food Mat** Credit: 3 hours.

Physical properties of foods and biological materials; design of processing equipment and the sensing and control of food processes; thermal, electromagnetic radiation, rheological, and other mechanical properties. Includes laboratory. Prerequisite: TAM 251; either CHBE 421 or both ME 330 and TAM 335.

**485 Food and Process Eng Design** Credit: 2 hours.

Design of equipment, processes, and facilities for food, pharmaceutical, biotechnology, and related process industries. Prerequisite: ABE 483.

**487 Grain Drying and Conditioning** Credit: 3 hours.

Psychrometric principles of air modification for dehydration and conditioning of moist products, emphasizing the drying of cereal grains; industrial dryers; design of drying, cooling, and aeration systems. Includes laboratory. Prerequisite: ABE 222. Recommended ME 300.

**488 Bioprocessing Grains for Fuels** Credit: 3 hours.

Study of engineering and scientific principles involved in bioprocessing of cereal grains for production of ethanol and other fermentation products. Process unit operations, conventional and alternative feed stock materials, recovery of value-added coproducts and other variables involved in producing fuel ethanol will be discussed. Process simulation and economic analysis will also be addressed. Prerequisite: CHBE 321 and TAM 251.

**489 Process Des for Corn Milling** Credit: 3 hours.

Engineering and scientific principles involved in the major corn fractionation processes of wet milling, dry milling and alkali cooking, including structural and diffusional characteristics of corn, steeping phenomena and chemical and mechanical fractionation methods. Principles of process design and mill operation. Prerequisite: One of CHBE 421, ME 300, ME 320.

**497 Independent Study** Credit: 1 to 4 hours.

Individual research, special problems, thesis, development and/or design work under the supervision of a member of the faculty. 1 to 4 undergraduate hours. May be repeated to a maximum of 8 hours. Prerequisite: Consent of instructor.

**498 Special Topics** Credit: 1 to 4 hours.

Group discussion or an experimental course on a special topic in agricultural engineering. May be repeated to a maximum of 16 hours.

**501 Graduate Research I** Credit: 1 hours.

Basic research orientation, research methods, presentation skills, laboratory practices, case studies, and professional and ethical conduct.

**502 Graduate Research II** Credit: 1 hours.

Research methodology, teaching methods, lecture preparation and delivery, critical review of scientific articles, peer review and publishing, mentoring and peer relationships, time management, and intellectual property.

**561 Off-Road Vehicle Mechatronics** Credit: 4 hours.

Emphasizes integrated skills in designing mechatronic systems with regard to off-road vehicles. Main topics include fundamentals for mechatronic systems design; modeling of off-road vehicle systems, on-vehicle information management, and intelligent vehicle controls. Prerequisite: One of ABE 425, ME 261, MFGE 430; ECE 486 or ME 460.

**594 Graduate Seminar** Credit: 0 hours.

Presentations of thesis research by graduate students; other presentations on teaching or current research issues related to agriculture, biology, and engineering. Approved for S/U grading only. May be repeated up to a maximum of 6 times.

**597 Independent Study** Credit: 1 to 4 hours.

Individual investigations or studies of any phases of agricultural engineering selected by the student and approved by the advisor and the faculty member who will supervise the study. May be repeated to a maximum of 16 hours. Prerequisite: Consent of instructor.

**599 Thesis Research** Credit: 0 to 16 hours.

May be repeated. Approved for S/U grading only.