Department of Biological and Agricultural Engineering

Biological and agricultural engineers apply their knowledge of physical and biological sciences, mathematics, engineering principles and engineering design to the production and processing of food and fiber, to the preservation of environmental quality, to biological systems and processes, and to machine systems that interface with all of these. Because of their broad general engineering background, biological and agricultural engineering graduates are sought by a wide variety of employers including environmental consulting firms, equipment manufacturers, crop storage and handling industries, the cotton and forest products industries, food and feed processing industries, animal production industries, biotechnology companies, electric utility companies, chemical companies, and governmental agencies. Biological and agricultural engineers make significant contributions to meeting many basic needs of society such as maintaining food quality, quantity and safety; improving environmental quality; and enhancing the quantity and quality of our water resources.

The Biological and Agricultural Engineering Department provides quality education, research and outreach in engineering and technology for the world’s agricultural, biological, environmental and food systems. Our undergraduate programs provide a high quality education for engineering and systems management students to fulfill the needs of industries we serve and advance our reputation as a world leader in engineering and systems management education.

Faculty

Agarwal, Girish S, Professor
Biological and Agricultural Eng
PHD, University of Rochester, 1969

Capareda, Sergio C, Professor
Biological and Agricultural Eng
PHD, Texas A&M University, 1990

Castell-Perez, M Elena, Professor
Biological and Agricultural Eng
PHD, Michigan State University, 1990

Fernando, Sandun D, Professor
Biological and Agricultural Eng
PHD, University of Nebraska, 2003

Gomes, Carmen L, Associate Professor
Biological and Agricultural Eng
PHD, Texas A&M University, 2010

Huang, Yongheng, Associate Professor
Biological and Agricultural Eng
PHD, University of Nebraska - Lincoln, 2002

Karthikeyan, Raghupathy, Associate Professor
Biological and Agricultural Eng
PHD, Kansas State University, 2001

Kingman, Douglas M, Instructional Associate Professor
Biological and Agricultural Eng
PHD, Purdue University, 2002

Lacey, Ronald E, Professor
Biological and Agricultural Eng
PHD, University of Kentucky, 1992

Mohanty, Binayak P, Professor
Biological and Agricultural Eng
PHD, Iowa State University, 1992

Mohtar, Rabi H, Professor
Biological and Agricultural Eng
PHD, Michigan State University, 1994

Moreira, Rosana G, Professor
Biological and Agricultural Eng
PHD, Michigan State University, 1989

Munster, Clyde L, Professor
Biological and Agricultural Eng
PHD, North Carolina State University, 1992

Nikolov, Zivko L, Professor
Biological and Agricultural Eng
PHD, Iowa State University, 1986

Riskowski, Gerald L, Professor
Biological and Agricultural Eng
PHD, Iowa State University, 1986

Searcy, Stephen W, Senior Professor
Biological and Agricultural Eng
PHD, Oklahoma State University, 1980

Singh, Vijay P, Professor
Biological and Agricultural Eng
PHD, Colorado State University, 1974

Smith, Patricia K, Professor
Biological and Agricultural Eng
PHD, North Carolina State University, 2000

Stark, Gregory L, Assistant Professor of the Practice
Biological and Agricultural Eng
MPH, University of Nebraska - Lincoln, 1986

Thomasson, John A, Professor
Biological and Agricultural Eng
PHD, University of Kentucky, 1997

Majors

- Bachelor of Science in Agricultural Systems Management (http://catalog.tamu.edu/undergraduate/agriculture-life-sciences/biological-agricultural-engineering/agricultural-systems-management-bs)
- Bachelor of Science in Biological and Agricultural Engineering (http://catalog.tamu.edu/undergraduate/agriculture-life-sciences/biological-agricultural-engineering/bs)
Minors


Courses

- Agricultural Systems Management (AGSM) (p. 2)
- Biological Agricultural Engineering (BAEN (p. 4))

Agricultural Systems Management

AGSM 125 Introduction to Agricultural Systems Management
Credit 1. 2 Lab Hours.
Introduction to technical management of agricultural systems using management projects presented by agricultural managers from industry; problem definition, information search, idea generation and development of management solutions.
Prerequisite: Freshman or sophomore classification or approval of instructor; majors only.

AGSM 201 Agricultural Energy and Power Systems
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Elementary principles of surface and ground water supply, flood control, water distribution systems and irrigation systems; principles of drainage, soil conservation and erosion control; elementary surveying, chaining, leveling and mapping applied to agricultural and natural resource needs; principles of drainage, soil conservation and erosion control; elementary surveying, chaining, leveling and mapping applied to agricultural and natural resource needs.
Prerequisites: Any 3 hours of MATH and MATH 142.

AGSM 284 Internship
Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours.
No Credit. Practical experience working in a professional agricultural systems management setting. May be taken three times.
Prerequisite: Freshman or sophomore classification, or approval of department head.

AGSM 285 Directed Studies
Credits 0 to 4. 0 to 4 Other Hours.
Selected problems in any phase of agricultural systems management; credit and specific content determined by the instructor; individual consultations and reports required.
Prerequisites: Freshman or sophomore classification, or approval of instructor.

AGSM 291 Research
Credits 0 to 3. 0 to 3 Other Hours.
Research conducted under the direction of faculty member in agricultural systems management.
Prerequisites: Approval of instructor.

AGSM 301 Systems Analysis in Agriculture
Credits 3. 3 Lecture Hours.
Operations research and systems theory applied to management problems in food and agricultural industries; linear programming, queuing theory, simulation and critical path method; provides the knowledge and computer skills to better manage resources for the evolving agricultural industries.
Prerequisites: MATH 141 and MATH 142 with a grade of C or better.

AGSM 310 Agricultural Machinery Management
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Selection of a matched complement of power units and machines for farming operations; consider constraints such as crops, season, weather, personnel and capital; apply systems such as linear programming, optimization, queuing theory and inventory models; utilize available software programs and learn to develop electronic spreadsheets and other customized software.
Prerequisites: AGSM 301; AGEC 330; or registration therein.

AGSM 315/FSTC 315 Food Process Engineering Technology
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Elementary mechanics, physical and thermal properties of food and processing materials, heat transfer, mass and energy balances, psychrometrical (properties of air), insulation.
Prerequisites: PHYS 201 or PHYS 218, or approval of instructor.
Cross Listing: FSTC 315/AGSM 315.

AGSM 325 Agri-industrial Applications of Electricity
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Elements of electric current generation and transmission, applications of electric heating, lighting and power, wiring, motors, energy rates, meter reading, safety rules and regulations.
Prerequisite: Agricultural systems management majors only or approval of instructor.

AGSM 335 Water and Soil Management
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Elementary principles of surface and ground water supply, flood control, water distribution systems and irrigation systems; principles of drainage, soil conservation and erosion control; elementary surveying, chaining, leveling and mapping applied to agricultural and natural resource needs; illustrated by practical examples of terracing and farm pond design.
Prerequisite: AGSM 301.

AGSM 337 Technology for Environmental and Natural Resource Engineering
Credits 3. 3 Lecture Hours.
For the nonengineering student in the environmental and management sciences; concentrates on the application of technology for solving local environmental problems while considering global issues; reduction of water, air and hazardous waste pollutants; legislative issues and modeling.
Prerequisites: AGSM 301 and MATH 142.

AGSM 355 Energy and Conversion Systems
Credits 3. 3 Lecture Hours.
Basic physical conversion principles of energy use, including historical and future patterns; conservation measures, alternative energy sources, and the environment impact of U.S. and world energy use.
Prerequisites: Junior or senior classification, non-majors only.
AGSM 360 Occupational Safety Management  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Safety considerations in the work environment, including safety mandates, safety mission, personal and business liability, fire, chemical, dust, machine noise, personal protective devices; design and implementation of safety programs.  
Prerequisite: Junior or senior classification.

AGSM 403 Processing and Storage of Agricultural Products  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Factors influencing the nature of biological materials and the preservation of quality throughout the harvesting, handling and processing system; a systems approach to cereal grains includes principles of drying, quality deterioration, storage, conveying and handling; processing of fiber crops.  
Prerequisites: AGSM 310 and AGSM 315/FSTC 315.

AGSM 417/FSTC 417 Food Process Engineering Technology II  
Credits 3. 3 Lecture Hours.  
Applications of basic engineering concepts to understand common unit operations in the food (and related) industry.  
Prerequisites: AGSM 315/FSTC 315 or FSTC 315/AGSM 315.  
Cross Listing: FSTC 417/AGSM 417.

AGSM 435 Irrigation Principles and Management  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Principles of irrigation and management for efficient use of water; soil-water-plant relationships; methods of application; power and labor requirements; automated systems and components.  
Prerequisites: AGSM 335, AGSM 301, MATH 141.

AGSM 439 Management of Agricultural Systems I  
Credits 3. 3 Lecture Hours.  
Application of agricultural systems management principles in solving realistic problems faced by agribusiness managers; project selection from problems posed by biological and agricultural industrial consultants; project feasibility study and outline; management and application philosophy; teamwork and communication, economics; product liability and reliability; standards and codes; goal setting and time management.  
Prerequisites: AGSM 301, AGSM 315/FSTC 315, AGSM 325, and AGSM 360; AGSM 335, AGSM 337 and AGSM 403 or registration therein; senior classification; must be taken prior to AGSM 440; AGSM majors only.

AGSM 440 Management of Agricultural Systems II  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Management of agricultural systems through team solution of management problems posed by agribusiness managers, farmers, extension specialists and other industry consultants; application of management principles to give students experience in solving realistic problems faced by agribusiness managers; critical evaluation of results by students, staff and consultants.  
Prerequisites: AGSM 439; should be taken last spring semester prior to graduation.

AGSM 461/SPSC 461 Geographic Information Systems for Resource Management  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Geographic Information System (GIS) approach to the integration of spatial and attribute data to study the capture, analysis, manipulation and portrayal of natural resource data; examination of data types/formats; integration of GIS with remote sensing and Global Positioning System; lab use of GIS applications to conduct analyses of topics in natural resources.  
Prerequisite: Junior or senior classification or approval of instructor.  
Cross Listing: SPSC 461/AGSM 461.

AGSM 470 Agricultural Electronics and Control  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Technology of electronic systems in agricultural production and processing, sensors, actuators, and controllers, controller hardware and computer bases.  
Prerequisite: AGSM 325.

AGSM 473 Project Management for Agricultural Systems Technology  
Credits 3. 3 Lecture Hours.  
Development of fundamental skill set in project management; basic knowledge of project management methods, tools and techniques; includes organization and life cycle, management processes, integration management, time management, cost management, quality management, communications management, risk management, procurement management, stakeholder management.  
Prerequisites: AGSM 301 and senior classification.

AGSM 475 Applied Information Technologies for Agricultural Systems  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Definition and documentation of the value of information in agriculturally-based technology companies; methods for mapping information flow within the company and across companies; articulation value of information within a value chain for a food product by simulation; and projects using project management software and web-based interactions.  
Prerequisites: ISTM 209 or equivalent; junior or senior classification.

AGSM 481 Seminar  
Credit 1. 1 Lecture Hour.  
Professional development; ethics; career opportunities and topics of interest related to the practice of agricultural systems management.  
Prerequisite: Senior classification.

AGSM 484 Internship  
Credits 0 to 6. 0 to 6 Other Hours.  
Practical experience working in a professional agricultural and/or food systems management setting. May be taken three times.  
Prerequisites: Junior or senior classification; approval of the instructor.

AGSM 485 Directed Studies  
Credits 0 to 4. 0 to 4 Other Hours.  
Selected problems in any phase of agricultural systems management; credit and specific content depend on background and interest of student; individual consultations and reports required.  
Prerequisites: Junior classification; approval of department head; 2.0 GPR.

AGSM 489 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Special topics in an identified area of agricultural systems management. May be repeated for credit.
AGSM 491 Research  
Credits 0 to 3. 0 to 3 Lecture Hours.  
Research conducted under the direction of faculty member in agricultural systems management. May be repeated 2 times for credit. Registration in multiple sections of this course are possible within a given semester provided that the per semester credit hour limit is not exceeded.  
Prerequisites: Junior or senior classification and approval of instructor.

Biological Agricultural Engineering

BAEN 150 Introduction to Biological and Agricultural Engineering Design  
Credit 1. 2 Lab Hours.  
Introduction to the engineering design process using design problems presented by biological and agricultural engineers from industry; problem definition, information search, idea generation and development of design concepts.  
Prerequisite: Engineering major or approval of department head.

BAEN 201 Analysis of Biological and Agricultural Engineering Problems  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Overview of Biological and Agricultural Engineering discipline through case studies and contemporary problems; introduction to computer programming; engineering analysis and problem solving using computer programming.  
Prerequisites: ENGR 111; MATH 151; CHEM 107 and CHEM 117 or BIOL 113 or PHYS 218.

BAEN 281 Professional Development Seminar  
Credit 1. 1 Lecture Hour.  
Familiarization with engineering design process used in professional environments where BAEN and AGSM graduates are employed; discussion of professional development topics; improvement of technical communication skills. May be taken 4 times for credit.

BAEN 284 Internship  
Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours.  
No Credit. Practical experience working in a professional biological and agricultural engineering setting. May be taken three times.  
Prerequisite: Freshman or sophomore classification; approval of the instructor.

BAEN 285 Directed Studies  
Credits 0 to 4. 0 to 4 Other Hours.  
Selected problems in any phase of agricultural engineering; credit and specific content dependent upon background, interest, ability and needs of student enrolled; individual consultations and reports required.  
Prerequisites: Freshman or sophomore classification; approval of department head.

BAEN 289 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of agricultural engineering. May be repeated for credit.  
Prerequisite: Approval of instructor.

BAEN 291 Research  
Credits 0 to 3. 0 to 3 Other Hours.  
Research conducted under the direction of faculty member in biological and agricultural engineering.  
Prerequisites: Freshman or sophomore classification and approval of instructor.

BAEN 301 Biological and Agricultural Engineering Fundamentals I  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Fundamental engineering concepts related to agricultural systems including the environment (soil, water, and air), plant and animal production systems and processing, and associated machines and facilities; application of techniques for data collection and analysis to problems in biological and agricultural engineering; design of experiments and communication of experimental results.  
Prerequisite: MEEN 221 or registration therein.

BAEN 302 Biological and Agricultural Engineering Fundamentals II  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Fundamentals of microbiology and biochemistry as they apply to biological and agricultural engineering systems to produce useful products and/or benign wastes; topics include microbiology, chemistry of biomolecules, microbial metabolism, bioenergetics, kinetics, mass transfer, bioreactor design, bioprocesses, and downstream processing.  
Prerequisites: BIOL 113; CHEM 222 or registration therein.

BAEN 320 Engineering Thermodynamics  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
First and second laws of thermodynamics; properties of pure substances; analysis of closed and open systems; applications to steady-flow and non-flow processes; power and refrigeration cycles; psychrometrics.  
Prerequisites: MEEN 221; MATH 251 or registration therein; junior or senior classification.

BAEN 340 Fluid Mechanics  
Credits 3. 3 Lecture Hours.  
Fundamentals of fluid properties; basic conservation principles of momentum, energy and continuity; flow through closed conduits; open channel flow; principles of turbomachines and compressible flow.  
Prerequisites: MEEN 221; BAEN 320; junior classification.

BAEN 354 Engineering Properties of Biological Materials  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Relationships between composition, structure and properties of biological materials; definition and measurement of mechanical, physical, thermal and other material properties; variability of properties; application of properties to engineering analysis and design of biological and agricultural processes and systems.  
Prerequisite: MEEN 222/MSEN 222.

BAEN 365 Unit Operations for Biological and Agricultural Engineering  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Theoretical and practical understanding of basic unit operations required to design processes and equipment in the agricultural, biological, environmental, and food industries, with unique constraints presented by biological and agricultural systems considered in design of all units.  
Prerequisites: BAEN 340; CVEN 305 or registration therein; junior or senior classification.

BAEN 366 Transport Processes in Biological Systems  
Credits 3. 3 Lecture Hours.  
Basic principles governing transport of energy and mass; application of these principles to analysis and design of processes involving biological, environmental and agricultural systems.  
Prerequisites: BAEN 340; BAEN 354; BAEN 365 or registration therein; MATH 308; junior or senior classification.
BAEN 370 Measurement and Control of Biological Systems and Agricultural Processes
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Theory and application of sensors and techniques in the design of systems for automatic control in biological systems and agricultural production and processing; sensor operation; signal processing; control techniques; automation and robotics.
Prerequisite: ECEN 215.

BAEN 375 Design Fundamentals for Agricultural Machines and Structures
Credits 3. 3 Lecture Hours.
Applications of stress/strain relationships and failure theory to the design of agricultural machines and structures; structural properties of engineering materials; finite element analysis and computer aided engineering design.
Prerequisite: CVEN 305.

BAEN 399 Professional Development
Credits 0. 0 Other Hours.
Participation in an approved high-impact learning practice; reflection on professional outcomes from the National Society of Professional Engineers’ Engineering Body of Knowledge; documentation and self-assessment of learning experience.
Prerequisites: Junior or senior classification; or approval of instructor.

BAEN 412 Hydraulic Power
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Hydraulic power systems; energy and power relationships; hydraulic fluid properties; frictional losses in pipelines; hydraulic pumps, cylinders, valves and motors; servo and proportional valves; circuit design and analysis; conductors, fittings and ancillary devices; maintenance of hydraulic systems; pneumatic components and circuits; electrical controls and fluid logic; electro-hydraulic systems.
Prerequisites: BAEN 340 and 375.

BAEN 414 Renewable Energy Conversions
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Energy/power systems through engineering and technical aspects of quantifying and designing the suitability of several types of renewable energy resources; new insights of vast resources that future engineers can harness to augment diminishing supplies of nonrenewable energy.
Prerequisite: BAEN 320, BAEN 366 or equivalent, or approval of instructor.

BAEN 417 Fundamentals of Nanoscale Biological Engineering
Credits 3. 3 Lecture Hours.
Nanostructures, nanofabrication methods, instrumentation and applications pertinent to Biological, Food and Bioenergy systems; identification and utilization of key tools available for fabricating, manipulating and analysis of nanostructures used in biological engineering applications.
Prerequisite: Senior classification in engineering or approval of instructor.

BAEN 422/CHEN 422 Unit Operations in Food Processing
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Design of food process engineering systems; basic concepts of rheology and physical properties of foods; fundamentals of heat and mass transfer and process control.
Prerequisites: CHEN 205 and 304, or CVEN 305.
Cross Listing: CHEN 422/BAEN 422.

BAEN 427 Engineering Aspects of Packaging
Credits 3. 3 Lecture Hours.
Introduction to properties and engineering aspects of materials for use as components of a package and/or packaging system; principles of design and development of packages; evaluation of product-package-environment interaction mechanisms; testing methods; environmental concerns; regulations.
Prerequisite: Senior classification or approval of instructor.

BAEN 431/CHEN 431 Fundamentals in Bioseparations
Credits 3. 3 Lecture Hours.
Design principles and application of chemical engineering unit operations to the production of therapeutic and bioactive molecules.
Prerequisite: BAEN 302 or BMEN 282/CHEN 282 or CHEN 282 or CHEN 382.
Cross Listing: CHEN 431/BAEN 431.

BAEN 440 Principles of Environmental Hydrology
Credits 3. 3 Lecture Hours.
Hydrologic cycle; precipitation, evaporation, evapotranspiration, infiltration, percolation, runoff, streamflow; groundwater and surface water flow; transport of contaminants in surface water; measurement and analysis of hydrologic data for engineering design.
Prerequisites: BAEN 340; senior classification.

BAEN 464 Irrigation and Drainage Engineering
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Engineering principles and design of both surface and pressurized irrigation systems; introduction to the design of surface and subsurface drainage systems including crop water requirements, soil moisture, irrigation scheduling, surface irrigation, sprinkler irrigation, trickle irrigation, pumps, pipelines, irrigation canals, irrigation wells, and surface and subsurface drainage.
Prerequisite: BAEN 340.

BAEN 465 Design of Biological Waste Treatment Systems
Credits 3. 3 Lecture Hours.
Management and treatment of high organic content wastes, with emphasis on agricultural and food processing wastes; engineering design of biological waste treatment processes; regulatory aspects affecting management of agricultural wastes.
Prerequisites: BIOL 113 and CHEM 222, or BAEN 302 and BAEN 340; or approval of instructor.

BAEN 468 Soil and Water Conservation Engineering
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Engineering principles of soil and water conservation; open channel flow principles, hydraulic grade stabilization, erosion control, storm water management, design of structures for floodwater routing, culvert design, design of waterways and agricultural reservoirs, stream bank protection, water quality assessment, groundwater flow, surface water modeling.
Prerequisites: BAEN 340; CVEN 305.

BAEN 469 Water Quality Engineering
Credits 3. 3 Lecture Hours.
Nonpoint source pollution processes including transport mechanisms and contaminant fate; design of best management practices for abating nonpoint source pollution.
Prerequisites: BAEN 340 or equivalent; CVEN 305.
BAEN 471/CHEN 471 Bioreactor Engineering  
Credits 3. 3 Lecture Hours.  
Fundamentals of microbial and enzyme kinetics; basic biochemical reaction theory and reactor systems; heterogeneous reactions and transport considerations in enzyme and cell reactors, and immobilized systems; bioreactor design considerations in bioprocessing.  
Prerequisite: CHEN 282 or CHEN 382 or BAEN 302; junior or senior classification in engineering or approval of instructor.  
Cross Listing: CHEN 471/BAEN 471.

BAEN 477 Air Pollution Engineering  
Credits 3. 3 Lecture Hours.  
Design of air pollution abatement equipment and systems to include cyclones, bag filters and scrubbers; air pollution regulations; permitting; dispersion modeling; National Ambient Air Quality Standards.  
Prerequisite: CVEN 305 or equivalent.  
Cross Listing: MEEN 477 and SENG 477.

BAEN 479 Biological and Agricultural Engineering Design I  
Credits 3. 3 Lecture Hours.  
Capstone design project selection from problems posed by biological and agricultural engineers in industrial practice; completion of project feasibility study and outline; design philosophy, teamwork and communication; economics; product liability and reliability; use of standards and codes; goal setting, professional development, and time management; project to be completed in BAEN 480.  
Prerequisites: BAEN 340 and BAEN 365; BAEN 366 or BAEN 370.

BAEN 480 Biological and Agricultural Engineering Design II  
Credits 3. 6 Lab Hours.  
Continuation of engineering design experience through team solution of design problem developed in BAEN 479; preparation of design solution under supervision of biological and agricultural engineering staff and clients; critical evaluation of results by students; staff and industrial consultants.  
Prerequisites: BAEN 479; senior classification.

BAEN 481 Seminar  
Credit 1. 1 Other Hour.  
Review of current literature dealing with agricultural engineering problems presented by staff members and students.  
Prerequisite: Senior classification.

BAEN 484 Internship  
Credits 0. 0 Lecture Hours. 0 Lab Hours. 0 Other Hours.  
No Credit. Practical experience working in a professional biological and agricultural engineering setting. May be taken three times.  
Prerequisite: Junior or senior classification; approval of the instructor.

BAEN 485 Directed Studies  
Credits 0 to 4. 0 to 4 Other Hours.  
Selected problems in any phase of agricultural engineering. Credit and specific content dependent upon background, interest, ability and needs of student enrolled. Individual consultations and reports required.  
Prerequisites: Junior or senior classification and approval of department head.

BAEN 489 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.  
Special topics in an identified area of agricultural engineering. May be repeated for credit.  
Prerequisite: Approval of department head.