

BAEN - BIOLOGICAL & AG ENGR

BAEN 601 Advanced Agricultural Systems Analysis

Credits 3. 3 Lecture Hours. Application of data analytic thinking and data science techniques to the analysis and management of technical systems in agriculture; introduction to supervised and unsupervised methods applied to business problems in the food and agricultural sectors. **Prerequisite:** Graduate classification.

BAEN 614 Renewable Energy Conversions

Credits 3. 2 Lecture Hours. 2 Lab Hours. Managing energy/power systems through engineering and technical aspects of quantifying and designing the suitability of several types of renewable energy resources; providing new insights of vast resources that future engineers can harness to augment diminishing supplies of non-renewable energy. **Prerequisites:** BAEN 320 or approval of instructor.

BAEN 617 Fundamentals of Nanoscale Biological Engineering

Credits 3. 3 Lecture Hours. Nanostructures, nanofabrication methods, instrumentation and applications pertinent to Biological, Food and Bioenergy systems; provides opportunity to identify and utilize key tools available for fabricating, manipulating and analysis of nanostructures used in Biological Engineering applications. **Prerequisite:** Graduate classification.

BAEN 620 Food Rheology

Credits 3. 3 Lecture Hours. Principles of elasticity, viscous flow and visco-elasticity applied to solid and liquid food materials; experimental determination of rheological properties using fundamental methods and empirical textural measurements; applications to food engineering research, textural measurement and quality control. **Prerequisites:** AGSM 315/FSTC 315 or FSTC 315/AGSM 315; PHYS 201 or equivalent; graduate classification; or approval from instructor.

BAEN 622 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:** Graduate classification.

BAEN 625 Advances in Food Process Engineering

Credits 3. 3 Lecture Hours. Application of engineering fundamentals to the design of novel/advanced food processing systems including food irradiation, advances in thermal process, food freezing, food dehydration. **Prerequisite:** Graduate classification.

BAEN 627 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:** Graduate classification.

BAEN 631 Bioprocesses and Separations in Biotechnology

Credits 3. 2 Lecture Hours. 2 Lab Hours. Application of engineering principles to recovery and purification of biological compounds derived from cell grown in bioreactors, transgenic animals, and plants. Process development, design, and scale up of downstream processes used in biotechnology and pharmaceutical industry. Emphasis on extraction, sedimentation, membrane filtration, precipitation, and liquid chromatography. **Prerequisites:** Graduate classification or approval of instructor.

BAEN 632 Bioaerosols and Modeling

Credits 3. 2 Lecture Hours. 2 Lab Hours. Overview of physical, mechanical, fluid dynamical, electrical, optical, and molecular aspects of bioaerosols; bioaerosol generation, sampling and deposition measurements including size distribution, morphology, chemical composition, bioaerosol samplers, sample analysis, dry and wet deposition, and biofilm resuspension; health effects of bioaerosols, antibiotic resistance, ambient sampling in industrial and agricultural fields. **Prerequisites:** Graduate classification.

BAEN 642/CVEN 642 Water-Energy-Food Nexus: Toward Sustainable Resource Management

Credits 3. 3 Lecture Hours. Principles and application of the Water-Energy-Food nexus to state, national and international Water-Energy-Food securities and the interlinkages between them; exploration of quantitative framework to develop and assess sustainable tradeoffs of resources; hands on experiences; relevant real world projects or case studies. **Prerequisites:** Strong analytical background; approval of instructor. **Cross Listing:** CVEN 642/BAEN 642.

BAEN 651 Geographic Information System 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, as well as the integration of GIS with remote sensing and Global Positioning System; laboratory includes extensive use of GIS applications to conduct analyses of topics in natural resources. **Prerequisites:** Graduate classification. **Cross Listing:** ECCB 651 and RWFM 651.

BAEN 652/ECCB 652 Advanced Topics in Geographic Information Systems

Credits 3. 2 Lecture Hours. 2 Lab Hours. Advanced GIS topics with a focus on modeling actual GIS applications including relational and database theory, design and implementation and its connection to GIS; surface analysis with digital terrain models; and an introduction to spatial statistics. **Prerequisite:** ECCB 651 or BAEN 651. **Cross Listing:** ECCB 652/BAEN 652.

BAEN 655 Principles of Modern Optical Spectroscopy

Credits 3. 3 Lecture Hours. Optical spectroscopic techniques—their principles, based on the fundamentals of electromagnetism, interaction of light with matter and modern physics; Laser Induced Fluorescence; fluorescence correlation spectroscopy—single molecule spectroscopy; Raman spectroscopy; optical coherence tomography; low coherence speckle interferometry; optical tweezers; imaging and microscopy beyond diffraction limit. **Prerequisites:** Graduate classification.

BAEN 661 Experimental Methods in Biological and Agricultural Engineering

Credits 3. 3 Lecture Hours. Planning and carrying out empirical research with appropriate application of statistical methods for experimental design and analysis; experimental design, data analysis, hypothesis testing, and experimental errors. **Prerequisites:** STAT 211, STAT 302, STAT 303, or STAT 651, or equivalent with approval of instructor.

BAEN 662 Statistical Methods in Biological and Agricultural Engineering

Credits 3. 3 Lecture Hours. Statistical methods applied to problems in biological and agricultural engineering; parameter estimation; probability distribution fitting; time-series analysis; random variable generation; uncertainty analysis. **Prerequisite:** Graduate classification.

BAEN 665 Design of Biological Waste Treatment Systems

Credits 3. 3 Lecture Hours. Management and treatment of high organic content waste streams, with emphasis on agricultural; municipal, and agro-industry wastewater; engineering design of biological waste treatment processes: resource recovery from waste streams: recycle and reuse of finished effluents. **Prerequisite:** Graduate classification or approval of instructor.

BAEN 669 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:** AGEN 350 or equivalent; SCSC 301; ENGR 214; graduate classification.

BAEN 670 Air Pollution Engineering

Credits 3. 3 Lecture Hours. Current topics in air pollution engineering including design and operation of air pollution abatement systems (cyclone, bag filters and scrubbers), emission factors, dispersion modeling, permitting, odor sensing and control, EPA/State Air Pollution Regulatory Agency (SAPRA), TSP, PM10, and PM2.5. **Prerequisites:** BAEN 477/MEEN 477 or MEEN 477/BAEN 477, or approval of instructor.

BAEN 672 Small Watershed Hydrology

Credits 3. 3 Lecture Hours. Hydrology of small agricultural watersheds; precipitation frequency analysis; infiltration; runoff; erosion theory; sediment transport theory; evapotranspiration, and use of hydrological models. **Prerequisites:** Graduate classification.

BAEN 673 Modeling Small Watersheds

Credits 3. 3 Lecture Hours. Transport of water and chemicals in small agricultural watersheds; simulation using hydrologic models coupled with geographical information systems (GIS); impact of land use on the quality of surface water and groundwater evaluated. **Prerequisites:** Graduate classification.

BAEN 674 Vadose Zone Hydrology

Credits 3. 3 Lecture Hours. Fundamental concepts and advanced mathematical and experimental techniques for quantifying water, chemical, microorganism, and heat transport in the vadose zone (between soil surfaces and groundwater); provides a common platform for addressing issues related to soil and water resources, hydrology, geochemistry, microbiology, ecology, hydrogeology, and environmental engineering. **Prerequisite:** Graduate classification.

BAEN 675 Hydrology Across Scale

Credits 3. 3 Lecture Hours. Advanced concepts of surface and subsurface hydrologic processes, measurements, and modeling techniques across different spatio-temporal scales; contemporary issues related to the soil and water resources, hydrogeology, geochemistry, microbiology, ecology, hydrology, and environmental engineering. **Prerequisite:** Graduate classification in any engineering, agricultural science or geoscience program with environmental focus.

BAEN 681 Seminar

Credit 1. 1 Other Hour. Reviews, reports and discussion of ideas, recent advances and current topics.

BAEN 683 Peer-Review Process and Publication

Credit 1. 1 Lecture Hour. Techniques for communicating results of research that are defensible in a peer review process; student and advisor will select a research topic, identifying an appropriate target refereed journal; no thesis/dissertation preparation as a writing project accepted; critique other papers; prepare paper for review by instructor. **Prerequisite:** Graduate classification in Biological and Agricultural Engineering only.

BAEN 684 Professional Internship

Credits 1 to 6. 1 to 6 Other Hours. An on-the-job supervised experience program, conducted on an individual basis in the area of the student's specialization in mechanized agriculture. **Prerequisite:** Graduate classification or approval of instructor.

BAEN 685 Directed Studies

Credits 1 to 4. 1 to 4 Other Hours. Advanced laboratory or field problems not related to student's thesis. **Prerequisite:** Graduate classification.

BAEN 689 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of agricultural engineering. May be repeated for credit.

BAEN 690 Theory of Research

Credit 1. 1 Lecture Hour. Development of research inquiry and discussion of applicable experimental design, theoretical techniques and methodological principles of conducting original research; evaluation of current research of faculty and students and in engineering and scientific literature. Communication of research proposals and results. May be repeated for credit. **Prerequisites:** Graduate classification.

BAEN 691 Research

Credits 1 to 23. 1 to 23 Other Hours. Research for thesis or dissertation.