BAEN - BIOLOGICAL & AG ENGR (BAEN)

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, biochemical 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
circuit 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/MSE 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.
Nanostuctures, nanofabrication methods, instrumentation and applications pertinent to Biological, Food and Bioenergy systems; identification and utilization of key tools available for fabricating, manipulating and analyzing 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 460 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: BAEN 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.

BAEN 491 Research  
Credits 0 to 3. 0 to 3 Other Hours.  
Research conducted under the direction of faculty member in biological and agricultural engineering. 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.