

Biosystems Engineering - BSEN

Courses

BSEN 2210 ENGINEERING METHODS FOR BIOLOGICAL SYSTEMS (2) LEC. 1. LAB. 3. Pr. (ENGR 1110 or ENGR 1113) and (PHYS 1600 or PHYS 1607) or Departmental approval. Introduction to experimental design methodology, basic engineering design and problem solving methodology for Biological Engineering. Visualization skills, computer-aided 3-D solid modeling of parts, 3-D assembly of solid part geometries, computation of mass properties, 2-D engineering drawings, engineering design process, safety, tools and fabrication processes and design, and hands-on shop fabrication of semester project.

BSEN 2240 BIOLOGICAL AND BIOENVIRONMENTAL HEAT AND MASS TRANSFER (3) LEC. 3. Pr. (MATH 2630 or MATH 2637) and (PHYS 1600 or PHYS 1607) and P/C ENGR 2010. Basic principles of heat and mass transfer with special applications to biological and environmental systems. Introduction to steady state and transient heat conduction. Convection, radiation, diffusion, simultaneous heat and mass transfer, and generation and depletion of heat and mass in biological systems.

BSEN 3210 MECHANICAL POWER FOR BIOSYSTEMS (3) LEC. 2. LAB. 3. Pr. ENGR 2010 and MATH 2650 and P/C ENGR 2350. Basic engineering analysis, synthesis, and design concepts applied to power sources, mobile equipment, and machinery applications for agricultural, forestry, and natural resource systems.

BSEN 3230 NATURAL RESOURCE CONSERVATION ENGINEERING (3) LEC. 2. LAB. 3. Pr. BSEN 3310. Departmental approval. Engineering analysis applied to natural resource systems. Design principles and practices in rainfall-runoff relationships, soil erosion and its prediction and control, hydraulic structures, and open channel hydraulics.

BSEN 3240 PROCESS ENGINEERING IN BIOSYSTEMS (3) LEC. 2. LAB. 3. Pr. BSEN 2240. Departmental approval. Theory and application of process operations in biological, food and agricultural systems. Heat transfer, fluid flow, thermal processing, evaporation, psychrometrics, refrigeration, drying freezing.

BSEN 3260 ENGINEERING FOR PRECISION AGRICULTURE AND FORESTRY (3) LEC. 2. LAB. 3. Pr. BSEN 3610 and MATH 2650. Departmental approval. Engineering aspects of spatial technologies applied to agricultural and forest production. Data collection in the field using GPS and use of field data in site specific applications. Fall.

BSEN 3310 HYDRAULIC TRANSPORT IN BIOLOGICAL SYSTEMS (4) LEC. 3. LAB. 3. Pr. (ENGR 2050 or ENGR 2053) and MATH 2650 or Departmental approval. Fluid properties, Non-Newtonian fluids and biological systems, Fluid statics, Energy equation, mass and momentum balance, pipe flow for Newtonian and Non-Newtonian fluids, dimensional analysis, compressible flows.

BSEN 3610 INSTRUMENTATION AND CONTROLS FOR BIOLOGICAL SYSTEMS (3) LEC. 2. LAB. 3. Pr. MATH 2650 and BSEN 2210. Departmental approval. Understanding of fundamentals of electrical circuits, sensing and sensors, simple digital electronics, analog measurement circuits, introductory digital signal processing, computer data acquisition.

BSEN 4200 POLYMERS FROM RENEWABLE RESOURCES (2) LEC. 2. Fundamental aspects of natural, biodegradable polymers, including fibers, adhesives, films and coatings, their synthesis, their structure/properties relationships, and the microbiology of their degradation.

BSEN 4210 IRRIGATION SYSTEM DESIGN (3) LEC. 2. LAB. 3. Pr. BSEN 3230. Departmental approval. Theory and design of irrigation systems for the application of water and wastewater including surveying techniques for system design. Systems include solid-set, traveler, center-pivot, and trickle. Fall.

BSEN 4250 HYDRAULIC CONTROL SYSTEMS DESIGN (3) LEC. 2. LAB. 3. Pr. BSEN 3310 or Departmental approval. Principles of energy transfer by means of fluid power. Design of hydraulic control systems using prime movers, valves, actuators, and accessories. Spring.

BSEN 4300 PROFESSIONAL PRACTICE IN BIOSYSTEMS ENGINEERING (2) LEC. 1. LAB. 3. Pr. ENGR 2070 and (BSEN 4240 or BSEN 3230). This course focuses on issues related to the professional practice of biological engineering including preparing students for transition to careers as professional engineers.

BSEN 4310 ENGINEERING DESIGN FOR BIOSYSTEMS (3) LEC. 1. LAB. 6. Pr. BSEN 4300. Departmental approval. Capstone design course in biosystems engineering emphasizing teamwork, communication, safety engineering, and economic analysis to complete an engineering design project. Spring.

BSEN 4960 SPECIAL PROBLEMS IN BIOSYSTEMS ENGINEERING (1-4) AAB/IND. Departmental approval. Faculty supervision of individual student investigations of specialized problems in biosystems engineering. May be repeated with change in problem. Course may be repeated with change in topics.

BSEN 4970 SPECIAL TOPICS IN BIOSYSTEMS ENGINEERING (1-4) DSL. Departmental approval. Individual or small group study of a specialized area in biosystems engineering. Course may be repeated for a maximum of 12 credit hours.

BSEN 4980 UNDERGRADUATE RESEARCH (2-4) IND. Departmental approval. Directed research in the area of specialty within the department. Course may be repeated for a maximum of 4 credit hours.

BSEN 5220 GEOSPATIAL TECHNOLOGIES IN BIOSYSTEMS (3) LEC. 2. LAB. 3. Pr. STAT 2510 or STAT 2513 or STAT 2610 or STAT 3010 or Departmental approval. Geospatial technologies including GPS, GIS, and remote sensing systems applied to biosystems. Collecting, managing, and analyzing spatial data for agricultural and forest systems. Spring.

BSEN 5230 WASTE MANAGEMENT AND UTILIZATION FOR BIOSYSTEMS (3) LEC. 2. LAB. 3. Pr. (CHEM 1040 or CHEM 1120) and BIOL 3200 and (BSEN 3230 or BSEN 4240). Introduction to animal waste management problems of confined production systems, and characterization of animal waste types. Design of biological treatment and processing systems. Departmental approval. May count either BSEN 5230 or BSEN 6230.

BSEN 5240 BULK BIOLOGICAL SOLIDS BEHAVIOR, HANDLING AND PROCESSING (3) LEC. 3. Pr. BSEN 3310 or CIVL 3310. Understanding of the properties of bulk solids and how these properties influence the behavior, handling and processability of biological solids.

BSEN 5250 DETERMINISTIC MODELING FOR BIOSYSTEMS (3) LEC. 3. LAB. 2. Pr. MATH 2650. Modeling of biosystems, methods to deal with complexity, and validation tools.

BSEN 5260 RENEWABLE ENERGY IN BIOSYSTEMS PROCESS OPERATIONS (3) LEC. 2. LAB. 3. Pr. BSEN 3310. Application and use of renewable energy in biological, food, forest and agricultural systems including bioenergy, solar energy, wind power and geothermal. Departmental approval. May count either BSEN 5260 or BSEN 6260.

BSEN 5270 METABOLIC ENGINEERING FOR BIOPROCESS (3) LEC. 3. Pr. BIOL 3200 and (CHEM 1040 or CHEM 1120). Or with the consent of the instructor. Introduction of basic principles of bioprocess engineering and metabolic engineering, to prepare engineers and scientists for biotechnology and bioeconomy industries.

BSEN 5280 LIFE-CYCLE ASSESSMENT FOR BIOLOGICAL SYSTEMS (3) LEC. 2. LAB. 1. Pr. BSEN 2240 and BSEN 3310. Introduces the concept of life cycle assessment (LCA) in the context of biological engineering. Examples will include LCA applications to engineered biological systems and other engineering processes and products.

BSEN 5510 ECOLOGICAL ENGINEERING (3) LEC. 3. Pr. BSEN 3230. Ecological engineering non-point source transport of nutrients, sediment, pesticides, pathogens, and chemicals from agricultural, forestry, and urban activities. Departmental approval. May count either BSEN 5510 or BSEN 6510.

BSEN 5520 WATERSHED MODELING (3) LEC. 3. Pr. BSEN 3230. Modeling of non-point source pollution at watershed scale using Soil and Water Assessment Tool model including underlying processes that control movement of pollutants. Departmental approval. May count either BSEN 5520 or BSEN 6520.

BSEN 5540 BIOMASS AND BIOFUELS ENGINEERING (3) LEC. 2. LAB. 3. Pr. (CHEM 1040 or CHEM 1120) and MATH 2650 and BSEN 3310. This course introduces the various processes and engineering principles in converting biomass into biofuels and chemicals. The focus will be on thermochemical and biochemical conversion platforms. May count either BSEN 5540 or BSEN 6540.

BSEN 5560 SITE DESIGN FOR BIOSYSTEMS (3) LEC. 2. LAB. 3. Pr. BSEN 3230 or (CIVL 3110 and CIVL 3010). Development of student skills in computer-aided site design and restoration by using rural and urban best management practices to reduce environmental impacts. Departmental approval. May count either BSEN 5560 or BSEN 6560.

BSEN 5570 COASTAL ECOLOGICAL ENGINEERING (3) LEC. 1. LAB. 4. Pr. BSEN 3310. Fundamentals of coastal processes and engineering and also provide an introduction to modeling the flow of water in coastal systems

BSEN 6220 GEOSPATIAL TECHNOLOGIES IN BIOSYSTEMS (3) LEC. 2. LAB. 3. Departmental approval. Geospatial technologies including GPS, GIS, and remote sensing systems applied to biosystems. Collecting, managing, and analyzing spatial data for agricultural and forest systems. Spring.

- BSEN 6230 WASTE MANAGEMENT AND UTILIZATION FOR BIOSYSTEMS (3)** LEC. 2. LAB. 3. Departmental approval. Coreq. BSEN 3230. Introduction to the animal waste management problems of confined production systems and characterization of animal waste types. Design of biological treatment and processing systems.
- BSEN 6240 BULK BIOLOGICAL SOLIDS BEHAVIOR, HANDLING AND PROCESSING (3)** LEC. 3. Understanding of the properties of bulk solids and how these properties influence the behavior, handling and processing ability of biological bulk solids.
- BSEN 6250 DETERMINISTIC MODELING FOR BIOSYSTEMS (3)** LEC. 2. LAB. 3. Modeling of biosystems, methods to deal with complexity, and validation tools.
- BSEN 6260 RENEWABLE ENERGY IN BIOSYSTEMS PROCESS OPERATIONS (3)** LEC. 2. LAB. 3. Pr. BSEN 3310. Departmental approval. Application and use of renewable energy in biological, food forest and agricultural systems including biomass and bioenergy, solar energy, wind power and geothermal.
- BSEN 6270 METABOLIC ENGINEERING FOR BIOPROCESS (3)** LEC. 3. Department/instructor approval. An introduction of basic principles of bioprocess engineering and metabolic engineering, to prepare engineers and scientists for biotechnology and bioeconomy industries. May count either BSEN 5270 or BSE 6270.
- BSEN 6280 LIFE-CYCLE ASSESSMENT FOR BIOLOGICAL SYSTEMS (3)** LEC. 2. LAB. 3. This course introduces the concept of life cycle assessment (LCA) in in the context of biological engineering. Examples will include LCA applications to engineered biological systems and other engineering processes and products.
- BSEN 6510 ECOLOGICAL ENGINEERING (3)** LEC. 3. Departmental approval. The course introduces students to ecological engineering non-point source transport of nutrients, sediment, pesticides, pathogens, and chemicals from agricultural, forestry, and urban activities.
- BSEN 6520 WATERSHED MODELING (3)** LEC. 3. Departmental approval. The course covers modeling of non-point source pollution at the watershed scale using Soil and Water Assessment Tool model including underlying processes that control movement of pollutants.
- BSEN 6540 BIOMASS AND BIOFUELS ENGINEERING (3)** LEC. 2. LAB. 3. This course introduces the various processes and engineering principles in converting biomass into biofuels and chemicals. The focus will be on thermochemical and biochemical conversion platforms. May count either BSEN 5540 or BSEN 6540.
- BSEN 6560 SITE DESIGN FOR BIOSYSTEMS (3)** LEC. 2. LAB. 3. Departmental approval. The course is designed to develop student skills in computer-aided site design and restoration by using rural and urban best management practices to reduce environmental impacts.
- BSEN 6570 COASTAL ECOLOGICAL ENGINEERING (3)** LEC. 1. LAB. 4. Fundamentals of coastal processes and engineering. Introduction to modeling the flow of water in coastal systems.
- BSEN 7110 FUNDAMENTALS OF INSTRUMENTATION FOR BIOLOGICAL SYSTEMS (3)** LEC. 2. LAB. 3. Departmental approval. Students will gain an understanding of the fundamentals of sensing and sensors, simple digital electronics and measurement circuits, introductory digital signal processing, and computer data acquisition. They will be required to build and test instrumentation to collect data on biological systems that might include fluid flow, pressure, force, or other transducers.
- BSEN 7140 ALGAE SYSTEMS ENGINEERING (3)** LEC. 2. LAB. 1. This course is a study of engineered systems for cultivating algae for various uses in society. To develop an understanding of engineering principles applied to growing, cultivating, and producing algal biomass for a number of applications, study into the biology, physiology, and ecology of algae and similar species will be a major part of the course. Departmental Approval.
- BSEN 7510 INTRODUCTION TO LAND AND WATER ENGINEERING (3)** LEC. 3. This course aims at equipping students with the engineering tools and knowledge needed for advanced courses in land and water engineering.
- BSEN 7520 INTRODUCTION TO FLUVIAL GEOMORPHOLOGY (3)** LEC. 3. Pr. BSEN 3230. This course provides an overview of stream geomorphology as it relates to natural stream physical processes.
- BSEN 7900 SPECIAL PROBLEMS IN BIOSYSTEMS ENGINEERING (1-4)** IND. Departmental approval. Faculty supervision of individual student investigations of advanced specialized problems in biosystems engineering at the graduate level. Pr., Course may be repeated with change in topics.

BSEN 7950 SEMINAR (1) SEM. SU. Reviews and discussions of research techniques, current scientific literature, and recent developments in biosystems engineering. Course may be repeated for a maximum of 12 credit hours.

BSEN 7970 SPECIAL TOPICS IN BIOSYSTEMS ENGINEERING (1-4) IND. Departmental approval. Individual or small group study of an advanced specialized area in biosystems engineering at the graduate level. Course may be repeated with change in topics.

BSEN 7990 RESEARCH AND THESIS (1-10) MST. Course may be repeated with change in topic.

BSEN 8990 RESEARCH AND DISSERTATION (1-12) DSR.