Biological Engineering (BENG)

Courses

BENG 5000V. Advanced Topics in Biological Engineering. 1-6 Hour.
Special problems in fundamental and applied research. Prerequisite: Graduate standing. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

BENG 51003. Advanced Instrumentation in Biological Engineering. 3 Hours.
Applications of advanced instrumentation in biological systems. Emphasis on updated sensing and transducing technologies, data acquisition and analytical instruments. Lecture 2 hours, lab 3 hours per week. Corequisite: Lab component. Prerequisite: BENG 31103. (Typically offered: Spring Even Years)

BENG 52503. Bio-Mems. 3 Hours.
Topics include the fundamental principles of microfluidics, Navier-Stokes Equation, bio/abio interfacing technology, bio/abio hybrid integration of microfabrication technology, and various biomedical and biological problems that can be addressed with microfabrication technology and the engineering challenges associated with it. Lecture 3 hour per week. Prerequisite: MEEG 35003 or CVEG 32103 or CHEG 21303. (Typically offered: Irregular)
This course is cross-listed with MEEG 52503.

BENG 56103. Simulation Modeling of Biological Systems. 3 Hours.
Application of computer modeling and simulation of discrete-event and continuous-time systems to solve biological and agricultural engineering problems. Philosophy and ethics of representing complex processes in simplified form. Deterministic and stochastic modeling of complex systems, algorithm development, application limits, and simulation interpretation. Emphasis on calibration, validation and testing of biological systems models for the purposes of system optimization, resource allocation, real-time control and/or conceptual understanding. Prerequisite: AGST 50203 or (STAT 30043 or STAT 50133) or INEG 23104. (Typically offered: Irregular)

BENG 56203. Life Cycle Assessment. 3 Hours.
This course will examine the process and methodologies associated with life cycle analysis (LCA). The course will explore the quantitatively rigorous methodology for life cycle inventory (LCI), LCA and life cycle impact assessment (LCIA). This course is offered on-line. The principal instructor will be a UA faculty member. (Typically offered: Spring)

BENG 56303. Linkages Among Technology, Economics and Societal Values. 3 Hours.
Addresses how macro-level change is influenced by the linkages among technology, economics and societal values. Three major course initiatives: 1) Developing a conceptual model for understanding how macro-level change has occurred over history; 2) Examining recorded history in order to develop a contextual appreciation for Society's current situation; and 3) Using statistical data to identify six overriding world trends that are likely to greatly impact society's goal of achieving sustainable prosperity and well-being in the foreseeable future. Prerequisite: Graduate standing or instructor permission. (Typically offered: Fall and Spring)

BENG 57003. Design and Analysis of Experiments for Engineering Research. 3 Hours.
Principles of planning and design of experiments for engineering research. Propagation of experimental error. Improving precision of experiments. Analysis of experimental data for optimal design and control of engineering systems using computer techniques. Students must have an introductory background in statistics. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component. (Typically offered: Irregular)

BENG 58001. Graduate Seminar. 1 Hour.
Reports presented by graduate students on topics dealing with current research in biological engineering. Prerequisite: Graduate standing. (Typically offered: Spring)

BENG 59203. Nonpoint Source Pollution Control and Modeling. 3 Hours.
Control of hydrologic, meteorologic, and land use factors on nonpoint source (NPS) pollution in urban and agricultural watersheds. Discussion of water quality models to develop NPS pollution control plans and total maximum daily loads (TMDLs), with consideration of model calibration, validation, and uncertainty analysis. Prerequisite: CVEG 32203. (Typically offered: Irregular)

BENG 59303. Environmental and Ecological Risk Assessment. 3 Hours.
Process and methodologies associated with human-environmental and ecological risk assessments. Environmental risk assessments based on human receptors as endpoints, addressing predominantly abiotic processes. Ecological risk assessments based on non-human receptors as endpoints. Approach using hazard definition, effects assessment, risk estimation, and risk management. Application of methods to student projects to gain experience in defining and quantifying uncertainty associated with human perturbation, management and restoration of environmental and ecological processes. (Typically offered: Spring)

BENG 59603. Modeling Environmental Biophysics. 3 Hours.
Interactions between the biosphere and the atmosphere. Connecting the physical environment of solar energy, wind, soil, and hydrology to the biosphere through plant ecophysiology. Boundary layer meteorology, photosynthesis and boundary layer modeling strategies, and the soil-plant-atmosphere continuum. Instrumentation, measurement and modeling strategies for understanding leaf-, landscape- and regional behaviors; and, the transfer, kinetics, and balance of momentum, energy, water vapor, CO_2, and other atmospheric trace gases between the landscape (vegetation and soil) and the atmosphere. Applications in sustainable agriculture, irrigation, land and water resources, and modeling plant water use and carbon uptake strategies. A working knowledge of calculus and a discipline related to the course is expected. Three hours of lecture per week. Students may not earn degree credit for both BENG 49603 and BENG 59603. Prerequisite: Instructor consent. (Typically offered: Spring Even Years)

BENG 59703. Advanced Practice in Water Quality Monitoring and Analysis. 3 Hours.
Application of water quality principles to a real world problem. Team project experience leading and developing quality assurance project plans, designing monitoring systems, selecting chemical analysis methods, estimating loads, performing trend analysis, basic model calibration and validation, team management, and technical report writing and oral presentations. Working with various clientele to analyze water quality data in the context of evaluating real-world problems and issues. Three hours of lecture per week. Prerequisite: Graduate standing. (Typically offered: Spring Odd Years)

BENG 6000V. Master's Thesis. 1-6 Hour.
Graduate standing required for enrollment. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

BENG 7000V. Doctoral Dissertation. 1-18 Hour.
Candidacy is required for enrollment. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.