

Course Catalog - Fall 2008

Bioengineering

120 **Introduction to Bioengineering** credit: 1 hours.

Lecture and discussion of recent trends in bioengineering; topics typically include the biological interaction with ultrasound and microwave radiation, modeling, instrumentation, biomaterials, biomechanics, biological heat and mass transfer, and medical imaging techniques.

199 **Undergraduate Open Seminar** credit: 1 to 5 hours.

May be repeated.

201 **Conservation Principles Bioeng** credit: 3 hours.

Introduction to material, energy, charge, and momentum balances in biological problems. Steady-state and transient conservation equations for mass, energy, charge, and momentum will be derived and applied to mathematically analyze physiological systems using basic mathematical principles, physical laws, stoichiometry, and thermodynamic properties. Prerequisite: CHEM 104, MCB 150, and PHYS 212.

202 **Cell & Tissue Engineering Lab** credit: 2 hours.

A comprehensive hands-on understanding of the principles of cell biology that are inherent in tissue engineering design. Provides experience in safely and skillfully manipulating cells of the four tissue types and performing various quantitative analyses on products produced by cells that have differentiated. Lab reports written in the style accepted by scientific journals will be required. For Bioengineering majors with sophomore standing.

280 **Biomedical Imaging** credit: 3 hours.

Same as ECE 280. See ECE 280.

297 **Individual Study** credit: 1 to 4 hours.

Special project or reading activity. May be repeated in the same or separate terms to a maximum of 12 hours. Prerequisite: Approved written application to department as specified by department or instructor.

298 **Special Topics** credit: 0 to 4 hours.

Study of selected topics in regular course format; variable content. May be repeated in the same or separate terms to a maximum of 8 hours. Prerequisite: As specified for each topic offering; see Class Schedule or departmental course information.

300 **Seminar** credit: 0 hours.

Survey lecture course intended to introduce a broad range of Bioengineering topics. Approved for S/U grading only. May be repeated.

397 **Individual Study** credit: 1 to 4 hours.

Special project or reading activity. Prerequisite: Approved written application to department as specified by department or instructor.

398 **Special Topics** credit: 1 to 4 hours.

Study of selected topics in regular course format; variable content. May be repeated to a maximum of 8 hours. Prerequisite: As specified for each topic offering; see Schedule or departmental course information.

406 **Veterinary Ortho Biomechanics** credit: 3 hours.

Same as VB 406. See VB 406.

414 **Biomedical Instrumentation** credit: 3 hours.

Introduction to engineering aspects of the detection, acquisition, processing, and display of signals from living systems; biomedical sensors for measurements of biopotentials, ions and gases in aqueous solution, force,

displacement, blood pressure, blood flow, heart sounds, respiration, and temperature; therapeutic and prosthetic devices; medical imaging instrumentation. Same as ECE 414. Prerequisite: ECE 205 or ECE 210.

415 **Biomedical Instrumentation Lab** credit: 2 hours.

Laboratory to accompany BIOE 414. Introduction to use of sensors and medical instrumentation for static and dynamic biological inputs. Students measure actual biomedical signals. Same as ECE 415. Prerequisite: Credit or concurrent registration in BIOE 414.

419 **Brain, Behavior & Info Process** credit: 3 hours.

Same as MCB 419, BIOP 419, and NEUR 419. See MCB 419.

461 **Cellular Biomechanics** credit: 4 hours.

Same as TAM 461. See TAM 461.

466 **Image and Neuroimage Analysis** credit: 3 or 4 hours.

Same as PSYC 466 and STAT 466. See PSYC 466.

467 **Biophotonics** credit: 3 hours.

Same as ECE 467. See ECE 467.

472 **Techniques in Biomolecular Eng** credit: 3 or 4 hours.

Same as CHBE 472. See CHBE 472.

473 **Biomaterials Laboratory** credit: 3 hours.

Same as MSE 472. See MSE 472.

475 **Modeling of Bio-Systems** credit: 3 or 4 hours.

Same as ECE 475. See ECE 475.

476 **Tissue Engineering** credit: 3 hours.

Provides an understanding of the principles of biology and materials science and their integration that are inherent in tissue engineering design. Prerequisite: Recommended: one year each of college-level chemistry, physics, mathematics, and materials science.

480 **Magnetic Resonance Imaging** credit: 3 or 4 hours.

Same as ECE 480. See ECE 480.

493 **Senior Research Project** credit: 2 to 4 hours.

Individual research project under the guidance of a faculty member. Intended for students planning to complete BIOE 499 (Senior Thesis) in the following semester. May be repeated to a maximum of 4 hours. Prerequisite: Consent of instructor.

497 **Individual Study** credit: 1 to 4 hours.

Special project or reading activity. May be repeated up to 8 hours in a term to a maximum of 12 total hours. Prerequisite: Approved written application to department as specified by department or instructor.

498 **Special Topics** credit: 1 to 4 hours.

Study of selected topics in regular course format; variable content. May be repeated to a maximum of 12 hours, but no more than 8 in any one term. Prerequisite: As specified for each topic offering; see Schedule or departmental course information.

499 **Senior Thesis** credit: 2 hours.

A formal research project in Bioengineering. Preparation and oral presentation of a written thesis that reports the results of the project. Prerequisite: BIOE 493 and consent of instructor.

500 **Graduate Seminar** credit: 1 hours.

Survey lecture course intended to introduce a broad range of Bioengineering topics. Approved for S/U grading only. May be repeated to a maximum of 2 hours.

501 **Seminar Discussion** credit: 1 hours.

Familiarizes students with reading and discussing academic journals in Bioengineering. Approved for S/U grading only.

502 **Bioengineering Professionalism** credit: 1 hours.

Introduces ethical questions and conduct, procedures, and professional standards in the practice of bioengineering. Includes authorship and mentoring, use of animal and human subjects, conflict of interest, ethical behavior in scientific research, intellectual property, and approval processes for drugs and biomedical devices.

504 **Analytical Methods in Bioeng** credit: 4 hours.

Mathematical topics as they relate to modeling of physiological and bio-molecular processes and the instrumentation used to measure those processes. Reviews matrix methods, probability, linear systems, and integral transforms. Introduces singular value decomposition, Bayesian decision making, and linear system solutions to ordinary differential equations. Topics are applied to biosensor design and evaluation, tracer kinetic modeling, and filtering/curving fitting approaches to forward modeling problems. Prerequisite: MATH 285.

507 **Advanced Bioinstrumentation** credit: 4 hours.

Instrumentation and underlying theory employed in bioengineering. Concepts in the design and operation of sensors, fundamentals of optics, basic control theory and systems, digital components, and fundamental principles of medical imaging techniques. Specific knowledge of one biomedical instrument/system will be emphasized including detailed mathematical analysis. Prerequisite: BIOE 504.

597 **Individual Study** credit: 1 to 8 hours.

Special project or reading activity. For engineering and life science majors. Prerequisite: Approved written application to department as specified by department or instructor.

598 **Special Topics** credit: 1 to 4 hours.

Study of selected topics in regular course format; variable content. May be repeated up to 8 hours in a term to a maximum of 12 hours. Prerequisite: As specified for each topic offering; see Schedule or departmental course information.

599 **Thesis Research** credit: 0 to 16 hours.

Bioengineering graduate thesis research. Approved for S/U grading only. May be repeated.