

Biomedical engineering Department

Chair

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Degrees Awarded

M.S. in Biomedical Engineering; Ph.D. in Biomedical Engineering

Biomedical engineering

Biomedical engineering is at the forefront of medicine's technologic revolution; its many successes have raised expectations for the prevention, diagnosis, and treatment of disease. Faculty at Stony Brook University have been active contributors to the cutting edge of this technology, and our University is building on internationally acclaimed strengths in Bioelectromagnetics, Biomechanics, Biomaterials, Biotechnology, Tissue Engineering, Instrumentation and Medical Imaging. These disciplines thrive through active interdisciplinary collaborations among the faculty in the College of Engineering and Applied Sciences, the School of Medicine, and the College of Arts and Sciences, all of which are in close proximity. This ongoing biomedical research, combined with unique facilities at the University, Brookhaven National Laboratory, and Cold Spring Harbor Laboratory have helped distinguish Stony Brook as a superb resource for education in both the engineering and health sciences. With these intellectual and physical resources, the program in Biomedical Engineering is positioned to provide a rigorous, cross-disciplinary graduate training and research environment for our students.

This is a very exciting time for Biomedical Engineering. New areas are opening each day, ranging from the engineering of tissues to making outer space habitable for mankind. It is an excellent time to begin your studies in Biomedical Engineering and we believe you will find Stony Brook a superb place to train. Our faculty is diverse, our commitment is high, and our facilities are unique. If there are any questions which we might address, please do not hesitate to contact us directly.

The Graduate Program in Biomedical Engineering at Stony Brook University trains individuals with baccalaureate degrees in engineering, applied mathematics, and the sciences to provide them with the synthesis, design, and analysis skills necessary to contribute effectively to the advancement of technology in health and medical care. The M.S. and Ph.D. degree programs are specifically designed to provide graduate students and engineering professionals with the knowledge and skills necessary to transfer recent developments in the basic sciences into commercially viable products and processes. Training of the student is accomplished by exposing the individual to the biology, engineering, and business concepts critical to succeeding in the biomedical research and development environment.

Training in Biomedical Engineering is directed by faculty from the College of Engineering and Applied Sciences, the School of Medicine, the College of Arts and Sciences, the Health Sciences Center, as well as from the Brookhaven National Laboratory and Cold Spring Harbor Laboratory. These diverse faculty provide a spectrum of research opportunities. Breadth and depth of exposure is a hallmark of the program, and one which we believe emphasizes the importance of multidisciplinary, collaborative approaches to real-world engineering problems in biology and medicine. Graduate training includes course instruction, participation in seminar courses, and extensive involvement in selected projects emphasizing synthesis and design skills. The graduate program is based in the Health Sciences Center, adjacent to University Hospital, and in close proximity to the Basic Sciences, Engineering, and Business Schools.

Admission Requirements of Biomedical engineering Department

Students may matriculate directly into either the M.S. or Ph.D. programs. For admission to the Program in Biomedical Engineering, the following are normally required:

- A. A four-year undergraduate degree in engineering or related field such as the physical sciences, or mathematics.
- B. An official transcript of undergraduate record and of any work completed at the graduate level.
- C. Letters of recommendation from three previous or current instructors/employers.
- D. Submission of a personal statement outlining your background, interests, and career goals in the field of biomedical engineering.
- E. Graduate Record Examination (GRE) General Test scores.
- F. Acceptance by both the Program and the Graduate School.

Stipends and tuition scholarships are available for selected students. Distribution of these awards will be based on GRE test scores, undergraduate performance, professional experience, and research/career objectives as outlined in a personal statement.

Requirements for the M.S. Degree in Biomedical engineering

A minimum of 31 graduate credits is required to earn the Master of Science in BME (non-thesis option) or 37 credits for the M.S. degree (thesis option). The program study can be chosen from any of the following approved tracks/specializations: [General](#), [Biomechanics](#), [Biosignals](#), [Medical Physics](#), or [Molecular Bioengineering](#). The General program of study can be custom tailored in consultation with your faculty advisor/mentor to accommodate almost any BME area of interest. The following courses must be taken by all first-year graduate students: BME 501

Molecular Principles in Cell Biology, BME 502 Advanced Numerical and Computation Analysis to Biological Systems, BME 505 Principles and Practice of BME, BME 520 Lab Rotation I, and BME 521 Lab Rotation II. All students (except those pursuing the Medical Physics Track) must also fulfill a business/management course requirement, which can be met by taking BME 509 Fundamentals of the Bioscience Industry or any MBA class (MBA 501, MBA 502, MBA 503, MBA 504, MBA 505, MBA 506, MBA 507, MBA 511, or MBA 589) from the School of Business. A given track/specialization will have additional requirements, which includes a minimum of six technical elective courses (3 of which have to be BME).

Thesis or Non-Thesis Options. The student has the option of earning the Master of Science Degree in BME on either a thesis or non-thesis track. If non-thesis, the student undertakes elective graduate coursework to complete the 31 credits. In the thesis option, the student must additionally complete six credits of BME 599 Thesis Research, and submit and defend a written thesis. A grade point average of B or better must be attained for the core BME courses taken, and an overall grade point average of 3.0 out of 4.0 must be maintained overall. For the non-thesis option, most students can complete this program within three academic semesters, and most students complete the thesis option in four academic semesters. The non-thesis option is recommended for students who wish to pursue a career in industry that does not involve Research & Development (R&D). Students pursuing the non-thesis option cannot use BME 599 to fulfill any requirements (i.e., it is not a technical elective nor core course). The thesis option is recommended for students who will be continuing on for their doctoral degree and for students who wish to pursue an industrial career with an R&D focus.

All BME students must also take GRD 500.

Requirements for the Ph.D. Degree

A. Completion of the M.S. degree in Biomedical Engineering or equivalent graduate program

B. Satisfactory completion of the BME qualifying exam

C. Plan of Study

Student matriculating in to the doctoral (Ph.D.) degree program must complete all the requirements for the M.S. degree in BME at Stony Brook or enter the program with a relevant M.S. degree. This latter option is termed admission with “Advanced Standing”. After completion of the M.S. degree or admission with Advanced Standing, there are no course requirements per se, though certain courses may be required to fill any gaps in the student's knowledge. Following completion of a qualifying exam, an independent basic research program will be undertaken. Subsequently, the student will present and defend their dissertation proposal. Successful completion of this stage will enable the student to “Advanced to Candidacy”. One semester of teaching practicum must be satisfactorily performed. Completion of the research program will culminate in the submission and oral defense of a doctoral dissertation. The University requires at least two consecutive semesters of full-time graduate study.

D. Teaching Requirements

The BME teaching requirement for the Ph.D. degree can be fulfilled in any of the following three manners:

1. Deliver 4 lectures in a BME undergraduate or graduate course, and present a seminar that covers the state-of-the-art in your field of research.
2. Teach a BME course, either as the instructor of record (if you have G5 student status) or as the principal instructor (for G4 student status).
3. Petition for something else that is equivalent to the above.

E. Thesis Proposal Examination

After successful completion of the qualifying examination, the student selects a thesis advisor and writes a proposal for thesis research. After approval by the thesis advisor, the proposal is orally defended before a thesis committee.

F. Advancement to Candidacy

After successful completion of all required and elective courses, the qualifying examination, and the thesis proposal examination, the student will be recommended to the Graduate School for advancement to candidacy.

G. Dissertation

The research for the Ph.D. dissertation is conducted under the supervision of the thesis committee. The dissertation must represent a significant contribution to the scientific and/or engineering literature. Upon approval of the completed dissertation by the thesis committee, a formal public oral defense of the dissertation is scheduled at which the student presents their findings and is questioned by members of the examining committee and by other members of the audience. On acceptance of the dissertation by the thesis committee, all requirements for the degree will have been satisfied.

H. Time Limit/Residency Requirements

All requirements for the Ph.D. degree must be completed within seven years after completing 24 credits of graduate study. The University requires at least two consecutive semesters of full-time graduate study.

Faculty of Biomedical engineering Department

Distinguished Professors

Chu, Benjamin, Ph.D., 1959, Cornell University: Synthesis, characterization and processing of biomaterials, molecular manipulation and self-assembly in biomimetic mineralization, DNA complexation for gene therapy.

Rafailovich, Miriam, Ph.D., 1980, Stony Brook University: Polymeric liquids; phase transitions; thin film wetting phenomena; biopolymers.

Rubin, Clinton, T., Chair, Ph.D., 1983, Bristol University: Tissue adaptation; biophysical treatment of musculoskeletal disorders.

Professors

Benveniste, Helene, Ph.D., understanding diagnostic MR contrast parameters suitable to visualize neuro-pathology in neurodegenerative diseases.

Bluestein, Daniel, Ph.D., 1992, Tel Aviv University, Israel: Dynamics of fluid flow and cellular transport through vessels.

Brink, Peter, Ph.D., 1976, University of Illinois: Biophysical properties of gap junction properties.

Chiang, Fu-Pen, Ph.D., 1966, University of Florida: Development and application of various optical techniques such as moiré, holographic, interferometry, and speckle interferometry for stress analysis, nondestructive evaluation and metrology.

Clark, Richard, M.D., 1971, University of Rochester: Tissue engineering in wound repair.

Cohen, Ira, M.D., Ph.D., 1974, New York University: Electrophysiology of the heart.

Djuric, Petar, Ph.D., 1990, University of Rhode Island: Acoustic signal processing.

Einav, Shmuel, Ph.D., 1972, Stony Brook University: basic physiological flow phenomena as well as cellular and tissue engineering as applied to the vascular system.

Fowler, Joanna, Ph.D., 1967, University of Colorado: Radiotracer synthesis with positron emitters.

Grine, Fred, Ph.D., 1984, University of the Witwatersrand, Johannesburg, South Africa: Tooth enamel thickness and structure and the stresses experienced by tooth enamel during masticatory loading in primates.

Hannon, Gregory, Ph.D., 1992, Case Western Reserve University: Explores the mechanisms and regulation of RNA interference as well as its applications to cancer research.

Harrington, Donald, M.D., Ph.D., 1966, Marquette University: Magnetic Resonance Imaging in medicine.

Hsiao, Benjamin, Ph.D., 1987, Institute of Materials Science at University of Connecticut: Structural and morphological development of complex polymer systems during preparation and processing in real time.

Jacobsen, Chris, Ph.D., 1988, Stony Brook University: X-ray microscopy and holography.

Jesty, Jolyon, Ph.D., 1975, Yale University: Control mechanisms of coagulation, experimental and theoretical analyses.

Kaufman, Arie E., Ph.D., 1977, Ben-Gurion University: Computer graphics; visualization; interactive systems; 3-D virtual colonoscopy; computer architecture.

Liang, Jerome, Ph.D., 1987, City University of New York: Development of medical imaging hardware for single photon detection.

Mathias, Richard, Ph.D., 1975, UCLA: Research in biophysics seeks physical insights into how cells and tissues function.

Qin, Yi-Xian, Ph.D., 1997, Stony Brook University: Physical mechanisms involved in the control of tissue growth, healing, and homeostasis, especially bone adaptation influenced by mechanical environment.

Reichek, Nathaniel, M.D., 1965, Columbia University: Cardiac Magnetic Resonance Imaging; Myocardial mechanics, perfusion, viability.

Zhu, Wei, Ph.D., 1996, University of California, Los Angeles: Brain image analysis, design and analysis of clinical trials and other biomedical studies, and genetics modeling.

Associate Professors

Button, Terry, Ph.D., 1989, University at Buffalo: High-resolution computer-aided tomography.

Chen, Weiliam, Ph.D., 1993, University of Michigan: Controlled release biodegradable DNA delivery vehicles for gene therapy; innovative drug delivery systems

Dilmanian, F. Avraham, Ph.D., 1980, Massachusetts Institute of Technology: Computed tomography; radiation therapy.

Entcheva, Emilia, Ph.D., 1998, University of Memphis: Cardiac bioelectricity, electrical stimulation of cardiac tissue, mechanisms of cardiac arrhythmias, defibrillation and modulation of cell function through gene transfer.

Frame, Molly, Ph.D., 1990, University of Missouri: Microvascular flow control at the fluid dynamic and molecular levels.

- Gindi, Gene, Ph.D., 1982, University of Arizona: Algorithm development for medical imaging.
- Hadjiargyrou, Michael, Ph.D., 1992, City University of New York: Molecular mechanisms of bone development and regeneration.
- Judex, Stefan, Ph.D., 1999, University of Calgary, Canada: Molecular bioengineering; mechanical, molecular, and genetic influences on the adaptation of bone and connective tissues to physiologic stimuli.
- McCombie, Richard, Ph.D., 1982, University of Michigan: Structure and function in complex genomes.
- Pan, Yingtian, Ph.D., 1992, National Laser Technology Laboratories, China: Optical/NIR spectroscopy and imaging methods and applying these techniques to provide clinical diagnostic information.
- Penna, Louis, Ph.D., University of California Los Angeles: develop novel radiation protection drugs, and developed a method to make analogs (mimetics) of heparin-binding cytokines / growth factors.
- Powers, Scott, Ph.D., 1983, Columbia University: Cancer gene discovery; cancer diagnostics and therapeutics; cancer biology.
- Mueller, Klaus, Ph.D., 1998, Ohio State University: Computer graphics, data visualization, medical imaging.
- Rastegar, Jahangir, Ph.D., 1976, Stanford University: Robotics; biomechanics.
- Reintz, John, Ph.D., 1988, Yale University: the generation of body form, and specifically the determination of morphogenetic fields.
- Skiena, Steven, Ph.D., 1988, University of Illinois: Computational geometry; biologic algorithms.
- Solomon, Irene, Ph.D., 1994, University of California @ Davis: Reflex and central neural control of cardiovascular and respiratory function.
- Simmerling, Carlos, Ph.D., 1994, University of Illinois, Chicago: Simulate known properties of molecules, assist in the refinement and interpretation of experimental data.
- Stein, Lincoln, M.D., Ph.D., 1989, Harvard Medical School and University: Proactive approach to the genome information explosion by developing databases, data-analysis tools, and user interfaces to organize, manage, and visualize that vast body of information.
- Strey, Helmut, Ph.D., 1993, Technical University, Munich: Nanostructured Materials for Applications in Bioseparation, Drug Delivery and Biosensors.
- Zhang, Michael, Ph.D., 1987, Rutgers University: Identifying functional elements in eukaryotic genomes using mathematical and statistical methods.
- Zhao, Wei, Ph.D., 1997, University of Toronto, Canada: Development of novel detector concept and new clinical applications for early detection of cancer.
- Assistant Professors
- Dhundale, Anil, Ph.D., 1987, Stony Brook University: cDNA microarrays, functional genomics technologies; translational research.
- Goldstein, Rita, Ph.D., 1999, University of Miami: Multidisciplinary approach, to measure brain function such as functional (fMRI), (PET), (ERP) recordings, and neuropsychology.
- Miura, Michiko, Ph.D., 1984, University of California at Davis: Drug delivery methods; Developing new boron- carriers for BNCT.
- Mujica-Parodi, Lilianne, Ph.D., 1998, Columbia University: Relationships between four simultaneously or near-simultaneously interacting systems: neural, cardiac, endocrine, and cognitive, to better understand the neurobiology of arousal, fear, and stress.
- Neuwald, Andrew, Ph.D., 1987, University of Iowa: Statistical and algorithmic methods with their application to the classification and modeling of protein domains.
- Rizzo, Robert, Ph.D., 2001, Yale University: Application of computational techniques to drug discovery
- Schlyer, David, Ph.D., 1976, University of California, San Diego: Cyclotron targetry development; nuclear cross-section measurement; Biomedical imaging technology.
- Sitharaman, Balaji, Ph.D., 2005, Rice University: Research related to related to the diagnosis/ treatment of disease and tissue regeneration
- Wagshul, Mark, Ph.D., 1992, Harvard University: Utilizing MRI techniques for better understanding, diagnosing, and treating disease.
- Zhong, Zhong, Ph.D., 1996, Stony Brook University: Medical imaging and diagnosis using monochromatic x-rays, x-ray phase contrast, and x-ray optics.

Research Faculty

Ding, Yu-Shin, Ph.D., 1987, Stony Brook University: Investigation of biochemical transformations and drug mechanisms in primates and humans.

Gatley, John, Ph.D., 1975, University of Newcastle-upon-Tyne, England: Medical radionuclide imaging.

Goldfarb, James, Ph.D., 2000, Catholic University of Nijmegen: Research focuses on the application of magnetic resonance imaging (MRI) to the cardiovascular system, particularly in the areas of myocardial function and blood vessels.

Hainfeld, James, Ph.D., University of Texas-Austin: Development of organometallic cluster compounds to be used as high resolution molecular labels.

Kolsky, Kathryn, Ph.D., 1989, Carnegie Mellon University: Development and production of radioisotopes using the BLIP facility, a high-energy charged particle accelerator.

Logan, Jean, Ph.D., 1976, Louisiana State University: kinetic modeling of data from PET experiments.

Miller, Lisa, Ph.D., 1995, Albert Einstein College of Medicine: Research focuses on the study of the chemical makeup of tissue in disease using high-resolution infrared and x-ray imaging.

Thanos, Peter, Ph.D., Gene therapy and dopaminergic mechanisms of alcohol and drug abuse.

Tracey, Kevin, M.D., 1983, Boston University: Research focuses on the roles of individual mediators of systemic inflammation, and their regulation by interactions between the brain and the innate immune system.

Vaska, Paul, Ph.D., 1997, State University of New York at Stony Brook: Instrumentation for positron emission tomography (PET).

Vazquez, Marcelo, M.D., Ph.D., 1990, National University of La Plata, Argentina: Study of the mechanisms of central nervous system (CNS) damage induced by space radiation using in vitro (neural stem cells and neurons) and in vivo models

Wang, Yi, ScD., 1999, Washington University St. Louis: noninvasive in vivo cardiovascular imaging for the heart functional and morphological assessment using magnetic resonance imaging and image processing techniques.

Welsh, Keith T.: Clinical medical physics.

NOTE: The course descriptions for this program can be found in the corresponding program PDF or at COURSE SEARCH.