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The School of Biomedical Engineering, Science and Health Systems 2008-2009 Undergraduate Course Descriptions

Biomedical Engineering & Science Courses

BMES 125 Foundns of Biomed Engineering

This course provides students with an introduction to the fields of biomedical engineering at Drexel while covering aspects of evolutionary theory, complexity and systems biology important to biomedical engineers.

Credits: 2.00

College: School of Biomed Engineering, Science & Health Systems
Department: School of Biomedical Engineering, Science and Health Systems

BMES 212 The Body Synthetic

The Body Synthetic introduces concepts underlying biological and engineering principles involved in the design and construction of prosthetic devices used to replace various parts of the human body.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 301 Lab I: Exp Biomechanics

This course deals with experimental aspects of biomechanics, specifically with the testing mechanical properties of biological tissues.

Credits: 0.00 in 2.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 302 Lab II: Biomeasurements

This course introduces students to the measurement of physiological/biological/functional signals. Four specific signals will be collected and analyzed. Students are expected to analyze type of signal to be collected, and possible measurement techniques.

Credits: 0.00 in 2.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 303 Lab III: Biomed Electronics

This course introduces students to the widespread application of electronics and electronic devices in biomedical engineering. The course reinforces concepts learned in ECE 201 with hands-on experimentation related to biomedical applications.

Credits: 0.00 in 2.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 304 Lab IV: Ultrasound Images

This course introduces students to the engineering principles of acoustical measurements by combining hands-on laboratory experiences with lectures. Students will learn the engineering/physical principles of measuring sound velocity.

Credits: 0.00 in 2.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 305 Lab V: Musculoskel Anat for BME

This course provides an opportunity for students to study the anatomy and biomechanics of select articulations of the human body. While the main emphasis will be on the musculoskeletal structures associated with each articulation.

Credits: 2.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 310 Biomedical Statistics

This course is designed to introduce biomedical engineering students to the fundamentals of biostatistics necessary for medical research. Topics covered include measurements, sampling, basic hypothesis testing, analysis of variance and regression.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 315 Exp Design in Biomed Research

This course is designed to introduce students to the fundamental principles of experimental design and statistical analysis as applied to biomedical research with animals and humans. Topics to be covered include experimental design, and clinical design.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
Department: School of Biomedical Engineering, Science and Health Systems

BMES 325 Princ of Biomed Eng I

This course is the first part of a two-term sequence which introduces biomedical engineering students to engineering principles applied to biological and physiological systems. This course focuses on bioethical questions, biomechanics, and human performance.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 326 Princ of Biomed Eng II

This course is the second part of a two-term sequence which introduces biomedical engineering students to engineering principles applied to biological and physiological systems. This course focuses on bioinformatics, neuroengineering, and biosignal processing.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 330 Biorhythm Pharm/Toxicol

This course covers the fundamentals of biological rhythms with particular emphasis on the influence these cycles have on the susceptibility of organism to physical, chemical, and /or toxic agents.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 331 Computers in Health Systems I

Introduces the allied health professional to basic computer applications on personal computers. Includes word processing, spreadsheets, databases, and networking (e.g., e-mail and information search and retrieval) in a primarily Windows environment.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 335 Biomedical Informatics I

Introduces information and information handling systems for people in the allied health professions, with specific examples drawn from health care. Covers locating, manipulating, and displaying information in the health system setting.

Credits: 0.00 in 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 336 Hosp & Pat Info/Informatics II

Continues BMES 335. Emphasizes medical records and hospital and patient information handling. Examines the problems of patient information flow within the health care system. Introduces conventional and proposed patient and hospital information systems.

Credits: 0.00 in 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 338 Biomedical Ethics and Law

Introduces the wide spectrum of ethical, regulatory, and legal issues facing health care practitioners and health-related research workers. Helps students become aware of the ethical and legal issues involved in their work.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 340 Health Care Administration

This course provides students with an analysis of health care administration process, including: planning, organizing, designing,

decision-making, leading, and controlling. Presents methods and techniques that can contribute to effective performance.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 350 Med & Bio Effects Of Light

Examines the role of environmental lighting in human physiological and psychological processes. Topics include vitamin D synthesis and calcium regulation; light effects on bilirubin in newborns; and photoactivation and DNA in skin.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 363 Robotics in Medicine I

This course provides an introduction to the use of haptics (the use of somatosensory information) in the design of robotic devices in surgery. Topics covered include actuators, sensors, nonportable feedback, and portable force feedback.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 365 Robotics in Medicine II

This course covers the use of robots in surgery and included aspects of safety, robot kinematics, analysis of surgical performance using robotic devices, inverse kinematics, velocity analysis and acceleration analysis.

Credits: 3.00

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BMES 372 Biosimulation

This course provides the foundation for the mathematical analysis of biomedical engineering systems. It focuses on the essential mathematical methods necessary for further development of modeling and simulation skills in other courses.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 375 Computational Bioengineering

This course introduces undergraduate students to the mathematical and computational analysis of biological systems. The systems analyzed include the genome, protein and gene networks, cell division cycles, and cellular level disease.

Credits: 0.00 in 4.00

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BMES 381 Junior Design Seminar I

This is the first course in a two-course sequence intended to present the basics of engineering design, project management, product development and translational research. This first course focuses on engineering design and product development.

Credits: 0.00 in 2.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 382 Junior Design Seminar II

This is the second course in a two-course sequence intended to present the basics of engineering design, project management, product development and translational research. This second course focuses on project management and quality control.

Credits: 2.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 391 Biomedical Instrumentation I

This course introduces the student to the medical instrumentation and provides background on the physical, chemical, electronic and computational fundamentals by which medical instrumentation operates. It is an analytical course.

Credits: 0.00 in 3.00

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BMES 392 Biomedical Instrumentation II

Continues BMES 391. Explores the operation, safety aspects, and calibration of primarily optical and acoustical instruments, as well as those involving ionizing radiation. Also examines instrumentation primarily intended for particular departments.

Credits: 0.00 in 3.00

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BMES 401 Biosensors I

Introduces the general topic of microsensors, discusses basic sensing mechanisms for microsensors, and presents various types of conductometric, acoustic, silicon, and optical microsensors. Uses two case studies.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 402 Biosensors II

Investigates modern biosensor design methods and addresses the challenges associated with fabrication technologies and instrumentation techniques. Topics include theory and modeling of biosensors, and biosensor fabrication steps.

Credits: 0.00 in 4.00

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BMES 403 Biosensors III

Covers recent advances in biosensor technology and applications, business aspects, and technology transfer issues. Topics include new sensing mechanisms, new technologies, new biomedical applications, and the starting of small sensor companies.

Credits: 0.00 in 4.00

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BMES 405 Physiological Control Systems

Introduces the basic concepts of feedback and feed forward controls systems, including characterizations in terms of prescribed constraints, and study of input and output relationships for various types of physiological systems.

Credits: 3.00

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BMES 409 Entrepreneurship for BMES

This course serves as the foundation course in entrepreneurship and is designed to provide students with a complete working knowledge of the modern entrepreneurial and business planning process.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 411 Chronoengr I: Bio Rhythms

Introduces students to the concepts of biological, and especially circadian, rhythmicity. Advances students' knowledge of biological time-keeping and adaptive functions of biological clocks.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 412 Chronoengr II: Sleep Functions

Continues BMES 411. Enhances students' education in the concepts of biological, and especially circadian, rhythmicity. Focuses on sleep patterns, rhythms, evolution, neurology, psychology, and overall function.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 421 Biomed Imaging Sys. I: Images

Provides an overview of the field of medical imaging. Covers aspects of light imaging; systems theory, convolutions, and transforms; photometry, lenses, and depth of field; image perception and roc theory; and three-dimensional imaging.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 422 Biomed Imaging Systems II

Intended for students who would like to gain an adequate understanding of diagnostic ultrasound imaging principles and become familiar with developments in this rapidly expanding field. Introduces medical visualization techniques.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 423 Biomed Imaging Systems III

Covers volumetric and functional imaging systems. Discusses the principles and algorithms of projection tomography, XCAT, SPECT, PET; the principles of MRI: Bloch equation, slice selection, K-space scanning, volumetric MRI; and biochemical imaging.

Credits: 0.00 in 4.00

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BMES 430 Neur Asp of Posture & Locomot

Students will study the physiology of ensory/motor systems, with emphasis on modeling of neural systems and biomechanical aspects of functional tasks.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 432 Biomed Systems and Signals

Introduces various aspects of biomedical signals, systems, and signal processing. Covers topics in the origin and acquisition of biomedical signals; discrete-time signals and linear systems; and frequency analysis of discrete-time signals.

Credits: 3.00

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BMES 440 Introduction to Biodynamics

The objective of the course is to prepare students for biomechanical modeling, modeling methods, formulation of equations of motion and methods of determination of strength will be applied to human body dynamics.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 441 Biomechanics I:

Teaches students to use mechanical tools to get an introductory appreciation for solving biomechanical problems. Models human performance by using static, quasi-static, and dynamic approaches. Assesses overall loading of the musculoskeletal system.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 442 Biomechanics II

Teaches students to think biomechanically. Reviews and categorizes the various functional components (tissues) of the musculoskeletal system. Considers constraints of the joints and action of the soft and hard tissues, along with corresponding models.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 443 Biomechanics III

Provides more advanced knowledge of mechanics of materials and offers a general description of mechanical behavior of the variety of the

soft and hard tissues of the human body. Considers some prosthetic replacements of tissues.

Credits: 0.00 in 4.00

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BMES 444 Biofluid Mechanics

This course introduces flow-related anatomy and pathophysiology, and biomedical flow devices and their design challenges. Analysis methods to solve biological fluid mechanics design problems will be introduced.

Credits: 3.00

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BMES 451 Trans. Phenomena in Living Sys

Introduces students to applications of chemical engineering concepts in biological systems. Shows that chemical engineering approaches to problem solving are ideally suited to investigation of biology.

Credits: 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 452 Trans. Phen in Living Sys II

Continues BMES 451. Advances students' understanding of the engineering principles of membrane transport and its consequences at the subcellular (mitochondria), cellular (neuron), and organ (kidney) level.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 460 Biomaterials I

First course in a three-quarter sequence designed to acquaint students with the behavior of materials used in biomedical application under load (i.e., mechanical properties), their modes of failure and as a function of their environment.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 461 Biomaterials II

Second course in a three-quarter sequence in biomaterials. The goal of this course is with an understanding of, and ability to select, appropriate materials for specific applications taking into account mechanical, thermal, and rheological properties.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems
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BMES 466 Robotics in Medicine III

This course covers topics in the design of medical robotic systems, including force and movement analysis for robotic arms, dynamics, computer vision and vision-based control. Thus use of haptics, vision systems and robot dynamics are examined.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems

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BMES 471 Tissue Engineering I

Course is designed to familiarize students with the advanced concepts of cellular and molecular biology and physiology relevant to tissue engineering. The initial part of a two-quarter sequence.

Credits: 0.00 in 4.00

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BMES 472 Tissue Engineering II

Familiarizes students with advanced concepts of developmental and evolutionary biology relevant to tissue engineering. This second part of the two-quarter sequence combines material from cellular/molecular biology and evolutionary design and biomaterials.

Credits: 0.00 in 4.00

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BMES 475 Biomaterials & Tissue Engr III

This course provides students with in-depth knowledge of factor-mediated tissue engineering and regenerative medicine. Students learn about fundamental repair and regenerative processes and gain an understanding of specific biomaterials.

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems

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BMES 477 Neuroengineering I

Introduces the theory of neural signaling. Students will learn the fundamental theory of cellular potentials and chemical signaling, the Hodgkin Huxley description of action potential generation, circuit representations of neurons.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 478 Neuroengineering II

This course investigates cutting edge technologies in neuroengineering in a seminar-style format with faculty from the School of Biomedical Engineering and College of Medicine. Three modules cover topics, which vary from year to year. Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems

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BMES 480 Spec Top Biomed Engr/Sci

Covers topics related to the field of health care, systems, and technology. Past topics include health care administration.

Credits: 0.00 in 12.00

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BMES 483 Quantitative Systems Biology

This course uses a systems engineering approach to provide a foundation in systems biology and pathology informatics. Topics

covered include the robust complex network of genes and proteins; and cells as basic units of life.

Credits: 0.00 in 4.50

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 484 Genome Information Engineering

This course is designed to provide students with hands-on experience in the application of genomic, proteomic, and other large-scale information to biomedical engineering.

Credits: 0.00 in 4.50

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 488 Medical Device Development

Medical device product development must take into account a diverse set of disciplines to achieve a safe and successful product. This course exposes the student to several of these disciplines.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems

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BMES 491 Senior Design Project I

This is a writing intensive course.

Credits: 0.00 in 2.00

College: School of Biomed Engineering, Science & Health Systems

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BMES 492 Senior Design Project II

Credits: 0.00 in 2.00

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 493 Senior Design Project III

Credits: 0.00 in 4.00

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 494 Clinical Practicum I

This course provides biomedical engineering students with an extensive exposure to live clinical cardiology procedures, including cardiac catheterization, electrophysiology, echocardiography and nuclear stress testing.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 495 Clinical Practicum II

This course provides biomedical engineering students with an extensive exposure to live operations in an emergency department and intensive care unit. The students are expected to analyze specific operations within these environments.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 496 Clinical Practicum III

This course provides biomedical engineering students with an opportunity to observe basic operative and postoperative procedures with the idea of both learning about such procedures and identifying the role of biomedical engineering in these clinical settings.

Credits: 3.00

College: School of Biomed Engineering, Science & Health Systems

Department: School of Biomedical Engineering, Science and Health Systems

BMES 499 Independent Study in BMES

Credits: 0.50 in 6.00

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