# BIOMEDICAL ENGINEERING (BMEG)

**BMEG 205. Bioinstrumentation I. 1 Credit.**
**Offered Spring Semester Only; Lecture hours:3,Lab:2**
Introduction to analog and digital circuits with applications to medicine and biology. Corequisite: MATH 212. Prerequisite: MATH 202. Open to biomedical engineering majors only.

**BMEG 210. Fundamentals of Biomedical Engineering. 1 Credit.**
**Offered Spring Semester Only; Lecture hours:3,Other:2**
Introduction to the application of fluid mechanics, mass transfer, instrumentation, mechanics, and societal issues to biomedical problems. Hands-on laboratory experiences integrated with lecture. Prerequisites: MATH 201 and PHYS 211P. Open to biomedical engineering majors only.

**BMEG 220. Introduction to Engineering Computing. .5 Credits.**
**Offered Spring Semester Only; Lecture hours:2,Other:1**
Introduction to numerical methods and programming fundamentals. Problems drawn from mathematics, engineering, and biomedical engineering. Corequisite: MATH 212. Not open to students who have taken ENGR 211, ENGR 212, ENGR 214. Open to biomedical engineering majors only.

**BMEG 226. Statistical Methods in Biomedical Engineering. .5 Credits.**
**Offered Spring Semester Only; Lecture hours:2,Lab:1**
Introduction to concepts in experimental design and data analysis with application to biomedical engineering, medicine, and biology. Prerequisite: MATH 201. Not open to students who have taken ENGR 215, MATH 216 or MATH 226. Open to biomedical engineering majors only.

**BMEG 250. Fundamentals of Biomechanics. 1 Credit.**
**Offered Fall Semester Only; Lecture hours:3,Lab:2**
Application of mechanical analyses to solve biomechanical problems including: equilibrium of rigid bodies, anthropometric analysis, link segment analysis, internal loads, combined loading, failure theory. Prerequisites: PHYS 211 and MATH 201. Not open to students who have taken ENGR 220, ENGR 221 or MECH 220. Open to biomedical engineering majors only.

**BMEG 300. Biotransport I. 1 Credit.**
**Offered Spring Semester Only; Lecture hours:3,Lab:2**
First biotransport course. Fluid mechanics principles applied to biological systems and medical devices. Properties of biological fluids, energy and momentum balances, computational modeling. Prerequisite: MATH 212. Not open to students who have taken CHEG 300, ENGR 222, or ENGR 233. Open to biomedical engineering majors only.

**BMEG 350. Fundamental of Biomedical Signals and Systems. 1 Credit.**
**Offered Fall Semester Only; Lecture hours:3,Lab:2**
Time and frequency analysis, filter design and feedback control as applied to biomedical signals and systems. Prerequisites: BMEG 205 and MATH 212. Open to biomedical engineering majors only.

**BMEG 400. Biotransport II. 1 Credit.**
**Offered Fall Semester Only; Lecture hours:3,Lab:2**
Second biotransport course focusing on the advanced application of fundamental heat and mass transport concepts to biological systems and medical devices. Conduction, convection, thermal properties of materials, mass diffusion, compartmental modeling. Prerequisite: BMEG 300. Open to biomedical engineering majors only.

**BMEG 401. Biomedical Engineering Capstone I. 1 Credit.**
**Offered Fall Semester Only; Lecture hours:3,Lab:2**
Senior design course emphasizing the biomedical engineering design process including problem identification and medical motivation, background research, medical regulations and ethics, design and project proposal presentation. Prerequisite: BMEG 408. Open to biomedical engineering majors only.

**BMEG 402. Biomedical Engineering Capstone II. 1 Credit.**
**Offered Spring Semester Only; Lecture hours:3,Lab:2**
Second semester of the biomedical engineering design sequence emphasizing fabrication, instrumentation, testing and evaluation, and final presentation of projects. Prerequisites: BMEG 401. Open to biomedical engineering majors only.

**BMEG 408. Medical Device Assessment and Development. .5 Credits.**
**Offered Spring Semester Only; Lecture hours:2,Other:3**
An examination of medical device design including benchmarking, intellectual property, regulatory pathways, industry standards, project planning, project management, and individual and team professionalism. Topics will be applied to currently marketed medical devices. Prerequisites: BMEG 205. Open to biomedical engineering majors only.

**BMEG 409. Fabrication and Experimental Design. .5 Credits.**
**Offered Fall Semester Only; Lecture hours:2,Other:1**
A hands-on course focusing on skills relevant to biomedical engineers, such as computer-aided design and documentation, fabrication, materials, selection and biocompatibility. Cell culture and experimental design. Class will be a mixture of lectures and hands-on activities. Prerequisite: BMEG 226 or MATH 216. Open to biomedical engineering majors only.

**BMEG 425. Patients, Diseases, & Devices. 1 Credit.**
**Offered Either Fall or Spring; Lecture hours:3,Recitation:1**
Student-driven exploration of the comprehensive patient experience including disease cause and progression, clinical diagnosis and treatments, post-intervention care, and patient personal experiences and decisions. Prerequisite: permission of the instructor.

**BMEG 431. Biomimetic Materials. 1 Credit.**
**Offered Either Fall or Spring; Lecture hours:3,Recitation:1**
Introduction to topics in biomimetics, studying nature as an inspiration for engineering design. Topics include relationships between microstructure and physical properties of natural materials and tissue engineering approaches to biomaterials design. Prerequisite: permission of the instructor. Crosslisted as BMEG 631, MECH 478 and MECH 678.

**BMEG 437. Tissue Engineering. 1 Credit.**
**Offered Either Fall or Spring; Lecture hours:3,Recitation:1**
Course includes foundations of tissue engineering with a survey of current tissue engineering techniques used clinically, commercially and in research. The moral, social and ethical considerations of tissue engineering will be explored. Prerequisite: permission of the instructor.

**BMEG 441. Neural Engineering. 1 Credit.**
**Offered Either Fall or Spring; Lecture hours:3,Recitation:1**
Introduction to neural systems and engineering. Topics include neurophysiology, quantitative neural recording and stimulation models, neural signal acquisition and processing, clinical applications, and current field-wide challenges. Prerequisite: permission of the instructor. Crosslisted as ECEG 411 and ECEG 611.

**BMEG 451. Biomechanics and Injury Prevention. 1 Credit.**
**Offered Either Fall or Spring; Lecture hours:3,Recitation:1**
Survey course for field of biomechanics and research for injury prevention (lowering risk and/or severity). Mixture of lectures, labs, and projects. Prerequisite: permission of the instructor.

**BMEG 457. Accident Analysis. .5-1 Credits.**
**Offered Occasionally; Lecture hours:Varies**
Analysis of vehicle design and performance as it pertains to crashworthiness. Vehicle materials and structure, how vehicles are regulated with an emphasis on occupant safety. Studying the evolution of modern designs to minimize injuries includes reviewing many relevant biomechanics research studies. Crosslisted as MECH 457 and MECH 657.

**BMEG 463. Medical Imaging. 1 Credit.**
**Offered Either Fall or Spring; Lecture hours:3,Recitation:1**
Survey of medical imaging from the perspectives of the underlying physics and technology used to obtain images, software used to manage and manipulate images, and use of images in clinical and scientific practice. The economic, societal, cultural and ethical aspects of imaging will be addressed. Prerequisite: permission of the instructor.

**BMEG 471. Advanced Topics in Biomedical Engineering. 1 Credit.**
**Offered Fall Semester Only; Lecture hours:3,Recitation:1; Repeatable**
Advanced, in-depth course developed from areas of biomedical engineering. Topics will vary. Prerequisite: permission of the instructor. Crosslisted as BMEG 671.

**BMEG 472. Advanced Topics in Biomedical Engineering. 1 Credit.**
**Offered Spring Semester Only; Lecture hours:3,Recitation:1; Repeatable**
Advanced, in-depth course developed from areas of biomedical engineering. Topics will vary. Prerequisite: permission of the instructor. Crosslisted as BMEG 672.

**BMEG 480. Biomedical Engineering Project. .5 Credits.**
**Offered Fall Semester Only; Lecture hours:1,Other:5; Repeatable**
Individual work with a faculty adviser on development, design, or research project beginning with a written plan and culminating with a written or oral presentation. Prerequisite: permission of the instructor.

**BMEG 481. Biomedical Engineering Project. .5 Credits.**
**Offered Spring Semester Only; Lecture hours:1,Other:5; Repeatable**
Individual work with a faculty adviser on development, design, or research project beginning with a written plan and culminating with a written or oral presentation. Prerequisite: permission of the instructor.

**BMEG 490. Biomedical Engineering Research. 1 Credit.**
**Offered Fall Semester Only; Lecture hours:1,Other:10; Repeatable**
Independent study with a faculty adviser on a research or design project. Submit a proposal for group review, conduct the work, and culminate with a written report and an oral presentation before a faculty group. Prerequisite: permission of the instructor.

**BMEG 491. Biomedical Engineering Research. 1 Credit.**
**Offered Spring Semester Only; Lecture hours:1,Other:10; Repeatable**
Independent study with a faculty adviser on a research or design project. Submit a project proposal for group review, conduct the work, and culminate with a written report and an oral presentation before a faculty group. Prerequisite: permission of the instructor.