BIOMEDICAL ENGINEERING (B M E)

Any experimental courses offered by B M E can be found at:
registrar.iastate.edu/faculty-staff/courses/explistings/ **(**http://www.registrar.iastate.edu/faculty-staff/courses/explistings/**)**

Courses primarily for undergraduates:

B M E 220: Introduction to Biomedical Engineering
(Cross-listed with CH E). (3-0) Cr. 3. S.
Prereq: BIOL 212; (CHEM 167 or CHEM 177); (A B E 160 or AER E 160 or C E 160 or CH E 160 or CPR E 185 or E E 185 or ENGR 160 or I E 148 or M E 160 or S E 185); MATH 166; PHYS 232; PHYS 232L
Engineering analysis of basic biology and engineering problems associated with living systems and health care delivery. The course will illustrate biomedical engineering applications in such areas as: biotechnology, biomechanics, biomaterials and tissue engineering, and biosignal and image processing, and will introduce the basic life sciences and engineering concepts associated with these topics.

B M E 341: BioMEMs and Nanotechnology
(Cross-listed with E E). (3-0) Cr. 3.
Prereq: B M E 220
Overview of Micro-Electro-Mechanical-System (MEMS) technologies for bioengineering, fundamentals of microfluidic device design, fabrication, and characterization, survey of microfluidic functional building blocks for lab-on-a-chip applications including mixers, valves, channels, and chambers. Topics of nanotechnology in bioengineering, nanoscale building block technologies for bioengineering including self-assembling, surface chemical treatment, nano-imprinting, nano-particles, nano-tubes, nano-wires, and stimuli-responsive biomaterials.

B M E 352: Molecular, Cellular and Tissue Biomechanics
(3-0) Cr. 3.
Prereq: B M E 220; E M 324; MAT E 273
Introduction to the anatomy of the musculoskeletal system and connective tissue. Range of movement, joint dislocation, bone deformity and fracture. Application of continuum mechanics to both living and non-living systems. Laws of motion, free-body diagrams and simple force analysis of musculoskeletal system. Biomechanical response of soft and hard tissues with emphasis on microstructure and mechanical properties. Applications to bioengineering design.

B M E 440: Biomedical Applications of Chemical Engineering
(Cross-listed with CH E). (3-0) Cr. 3.
Prereq: (CH E 210 or CH E 220); (MATH 266 or MATH 267); PHYS 232
Applications of material and energy balances, transport phenomena, chemical reaction engineering, and thermodynamics to problems in biomedical engineering and applied physiology; survey of biomedical engineering; biomaterials; biomedical imaging.

B M E 447: Biomedical Design and Manufacturing
(Cross-listed with I E). (3-0) Cr. 3.
Prereq: Undergraduate students with three semesters or less before graduation while graduate standing for graduate students
Exploration of biology, materials, body mechanics, manufacturing, quality control, and ethics and the intersection of these subjects as they relate to biomedical manufacturing. Study of medical data (CT, MRI, etc.) processing, biomedical design, 3D bioprinting and additive manufacturing concepts.

B M E 450: Biosensors
(Cross-listed with E E). (3-0) Cr. 3.
Prereq: B M E 220
Overview of biosensors and bioanalytical challenges; designing for performance including various analytical problems, ion-selective membranes, characteristics of enzymes and basics of bioaffinity sensing; fundamentals of bioselective layers including depositing films and membranes, surfaces for immobilization and bioselective agents; survey of different biosensing technologies including electroanalytical, biomembrane, optical, and acoustic-wave based sensors.

B M E 450L: Biosensors Laboratory
(Cross-listed with E E). (0-3) Cr. 1.
Prereq: B M E 220; concurrent enrollment in B M E 450 or E E 450
Laboratory course accompanying B M E 450. Design, fabrication, and characterization of various electrical, chemical, polymer, optical and acoustic sensors.

B M E 456: Biomaterials
(Cross-listed with MAT E). (3-0) Cr. 3. F.
Prereq: CHEM 178; (MAT E 216 or MAT E 273 or MAT E 392)
Presentation of the basic chemical and physical properties of biomaterials, including metals, ceramics, and polymers, as they are related to their manipulation by the engineer for incorporation into living systems. Role of microstructure properties in the choice of biomaterials and design of artificial organs, implants, and prostheses.

B M E 490: Independent Study
Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.
Prereq: Permission of Professor in Charge of Bioengineering Minor
Investigation of biomedical engineering topics of special interest to student and supervising faculty member with a final written report.