3rd and 4th Year Info Session

Biomedical Engineering is a discipline that uses Engineering principles and quantitative methods to improve and sustain human health. It is based on the integration of the fundamental concepts of Physics, Chemistry and Biology within an Engineering perspective.

Specialities include: Neural Engineering, Bioengineering of the Brain, Rehabilitation Engineering, Sensory Communication, Brain-Machine Interface, Biological Signal Processing, Bioinformatics, Medical Imaging (MRI, Ultrasound), Medical Devices, Physiological System Modeling.

3rd and 4th Year Info Session

Area 4: Control, Communication and Signal Processing ‘Biomedical Engineering’

Depth Courses

- ECE445F Neural Bioelectricity

  Generation, transmission and significance of bioelectricity in neural networks. Topics covered include: (i) Basic features of the neural systems, (ii) ionic transport mechanisms, (iii) propagation in neural cables, (iv) extracellular fields, (v) biological neural networks, and (vi) learning and memory in artificial neural networks.

- ECE446F Sensory Communication

  Physical acoustics, electroacoustic transducers, and physiological acoustics. Speech processing, speech recognition algorithms and signal processing by the auditory system. Engineering aspects of acoustic design. Electrical models of acoustic systems. Noise, noise-induced hearing loss, and noise control. Introduction to vision and other modalities. Musical and psychoacoustics.

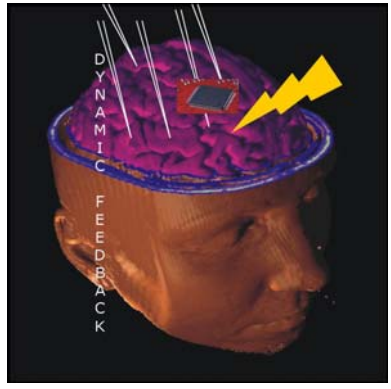
- ECE448F Biocomputation

  The fundamental concepts and challenges in molecular biology and the computational and statistical approaches applied to address them. Topics covered include: Basic concepts in molecular and structural biology, sequence-based algorithms, structure-based algorithms, and system biology algorithms. (Prerequisite: CHE353F Engineering Biology)

- BME595S Medical Imaging

  Magnetic resonance, ultrasound and X-ray imaging. Application of computer fundamentals, dynamics, calculus, basic EM theory, algebra, differential equations, signals and systems. The laboratory involves hands on NMR and ultrasound measurements as well as image analysis of MRI data.

Neural Engineering



Electroacoustic Testing Using a Head Model

3rd and 4th Year Info Session

Bioengineering 'Science' Courses

- CHE353F Engineering Biology

  Using a quantitative, problem solving approach, this course will introduce basic concepts in cell biology and physiology. Various engineering modelling tools will be used to investigate aspects of cell growth and metabolism, transport across cell membranes, protein structure, homeostasis, nerve conduction and mechanical forces in biology. (Exclusion: BME105).

- CHE354S Cellular and Molecular Biology

  Metabolic conversion of carbohydrates, proteins, and lipids; nucleic acids; enzymology; structure and function relationships within cells; and motility and growth. Genetic analysis, immunohistochemistry, hybridomis, cloning, recombinant DNA and biotechnology will also be covered. This course will appeal to students interested in environmental microbiology, biomaterials and tissue engineering, and bioprocesses. (Prerequisite: CHE353H1F).

- BME440F Bioengineering Instrumentation and Technology

  This course has a progression of laboratory experiments that start with directed experimentation and leads to open-ended design projects. In this course, the application of a basic science concept learned in other complementary courses will be examined in detail by experimentation. Topics will be drawn from the following list: PCR, microscopy, cellular simulation, protein/DNA/mRNA extraction, protein assays, drug delivery, colorimetric assays of enzymatic activity, industrial and commercial enzyme applications and clinical laboratory testing)\. Design and problem-solving skills will be developed by a design project based on material from the course. Laboratory work will be the main focus on the course and will stress practical applications of material covered in lecture. (Prerequisite: CHE353F Engineering Biology).

3rd and 4th Year Info Session

Bioengineering Minor and Stream

- MINOR = 6 courses, STREAM = 4 courses
- CORE (2 courses):
  - CHE 353 – Engineering Biology,
  - One of
    - CHE 354 – Cellular and Molecular Biology
    - MIE 331 – Physiological Control Systems
- ELECTIVES (4 for MINOR, 2 for STREAM)
  - Other of CHE 354, MIE 331
  - ECE 445 – Cellular Bioelectricity
  - ECE 446 – Sensory Communication
  - BME 595 – Biomedical Imaging
  - ECE 496 – Design Project (if in “bioengineering”) counts as 2