

Biomedical Engineering Specialization Tracks

Biomechanics

- Applies classical mechanics (statics, dynamics, fluids, solids, thermodynamics, and continuum mechanics) to biological or medical problems.
- Study of motion, material deformation, flow within the body and in devices, transport of chemical constituents across biological and synthetic media and membranes.
- Led to the development of the artificial heart and heart valves, artificial joint replacements, etc.
- Better understanding of the cardiovascular and musculoskeletal systems, among others.

Biomaterials

- The selection of an appropriate material to place in the human body may be one of the most difficult tasks faced by the biomedical engineer.
- Include both living tissue and artificial materials used for implantation, and their interaction.
- Traditional biomaterials: metal alloys, ceramics, polymers, and composites
- Newer biomaterials: incorporate living cells in order to provide a true biological and mechanical match for the living tissue, tissue engineering.

Bioelectricity & Bioimaging

- Understanding the interaction of electromagnetic fields with living tissues- for medical imaging, therapeutical and physiological function purposes
- Medical Imaging combines knowledge of a unique physical phenomenon (sound, radiation, magnetism, etc.) with high speed electronic data processing, analysis and display to generate an image (MRI, PET Scan, CT Scan, etc.).
- Images can be obtained with minimal or completely noninvasive procedures, making them less painful and more readily repeatable than invasive techniques.

Cellular & Molecular

- Cellular, Tissue and Genetic Engineering: involve more recent attempts to attack biomedical problems at the microscopic level.
- Utilize the anatomy, biochemistry and mechanics of cellular and sub-cellular structures in order to understand disease processes and to be able to intervene at very specific sites.
- Miniature devices to deliver compounds that can stimulate or inhibit cellular processes at precise target locations to promote healing or inhibit disease formation and progression. Gene delivery and therapy.