

# Bioengineering Applications Specialty

Department of Mechanical Engineering



M.E. Bioengineering Students perform their own simulated surgeries to learn the challenges of designing surgical devices.

Kettering University

## Objectives of Bioengineering Applications Specialty

The Bioengineering Applications Specialty addresses some of the unique engineering challenges found in biomedical equipment manufacturing. The philosophy is twofold:

First – to deepen the knowledge base of M.E. students in the following areas: Materials, Design, and Manufacturing.

Second – to provide M.E. students with a basic knowledge of medical applications of engineering,

automotive bioengineering (crash safety), and medical product design.

This concentration is designed to give students an introduction to the field of Medical Engineering without jeopardizing the fundamentals of the M.E. discipline. Students with this concentration graduate as Mechanical Engineers. At the same time, the combination of this concentration and the student's extensive co-op exposure at a biomedical firm will give them strong qualification for a biomedical-related career.

## Is it for Me?

Engineers have historically made great contributions to the advancement of medical diagnostic and therapeutic sciences. Biomedical problems are often exciting challenges for engineering solutions. The knowledge that engineers have been perfecting over many years is sometimes underutilized in medical fields. This provides great opportunities for the application of engineering fundamentals and skills

For example, in the orthopedics field, various implants are designed by engineers in collaboration with surgeons. Engineers also play a significant role in the development of new bio-compatible materials and suitable manufacturing processes for various medical devices. Kettering University works with a number of corporate employers in fields such as Electromedical, Ophthalmic, Orthopedics, Prosthetics, Surgical Instruments, and Health Services.

## Is a Co-op Job in the Bioengineering Field Required?

"Absolutely not! It may be "ideal", but it's nowhere near a necessity. When you're getting your education, you want to get good engineering experience out of your co-op employment – period. Think of it this way: Good engineering experience is valuable no matter what field of engineering you end up working in. It will serve

you in ANY field you pursue. Keep this truth in mind – while bioengineering may be your goal right now, nobody can predict how their interests may change over the years. Therefore, any co-op employer where you get an opportunity to gain good engineering experience is a good co-op employer." ~ Prof. Atkinson



M.E. Bioengineering students practice the surgical repair of a hip fracture in Kettering's Fracture Lab.

### Freshman I Term

CHEM-135/136	Principles of Chemistry & Lab
MECH-100	Engineering Graphical Communication <sup>1</sup>
ORTN-101	Orientation
MATH-101	Calculus I
COMM-101	Written & Oral Communication I

### Freshman II Term

HUMN-201	Introduction to Humanities
MATH-102	Calculus II
IME-100	Interdisciplinary Design & Manufacturing <sup>1</sup>
PHYS-114/115	Newtonian Mechanics & Lab

### Sophomore I Term

ECON-201	Economic Principles
MATH-203	Multivariate Calculus
MECH-210	Mechanics I
PHYS-224/225	Electricity and Magnetism & Lab

### Sophomore II Term

CHEM-145/146	Industrial Organic Chemistry & Lab
EE-212 &	Applied Electrical Circuits Lecture
MECH-231L	Signals for Mechanical Systems Lab
MATH-204	Differential Equations & Laplace Transforms
MECH-212	Mechanics II

### Junior I Term

IME-301	Engineering Materials
MATH-305	Numerical Methods and Matrices
MECH-310	Mechanics III
MECH-311	Intro. to Mechanical System Design <sup>2</sup>
SSCI-201	Introduction to the Social Sciences

### Junior II Term

COMM-301	Written & Oral Communication II
MECH-300	Computer Aided Engineering <sup>2</sup>
MECH-312	Mechanical Components I
MECH-320	Thermodynamics
MECH-350	Introduction to Bioengineering Applications

### Senior I Term

MATH-408	Probability and Statistics
MECH-322	Fluid Mechanics
MECH-330	Dynamic Systems I
	Advanced Humanities Elective
	Bio. Specialty Related Elective <sup>5,8</sup>

### Senior II Term

MECH-420	Heat Transfer
MECH-430	Dynamic Systems II
	Advanced Social Science Elective
	Bio. Specialty Related Elective <sup>5,8</sup>

### Senior III Term

LS-489	Senior Seminar
MECH-422	Energy Systems Lab
MECH-554	Bioengineering Applications Project
	Bio. Specialty Related Elective <sup>5,8</sup>

**Bioengineering Courses:** Listed below are the course requirements for completing a concentration in Bioengineering for Mechanical Engineering students.

#### **Required Courses:**

- MECH-350 Introduction to Bioengineering Applications (W/Sp)
- MECH-554 Bioengineering Applications Project (Su/F)

#### **Elective Courses (Choose 3):**

- BIOL-141/142 General Biology Lecture/Lab (Su/F)
- BIOL-241/242 Human Biology Lecture/Lab (W/Sp)
- BIOL-341 Anatomy and Physiology (Su/F)
- MECH-550 Auto. Bioengineering: Occupant Protection/Safety (W/Sp)
- MECH-551 Vehicle Collision Dynamics: Analysis/Reconstruction (Su/F)

For more information about Kettering University, the cooperative education program, and the Mechanical Engineering degree please contact the Department of Mechanical Engineering at 1-800-955-4464, ext. 9791 or visit the Bioengineering web page at: [http://www.kettering.edu/futurestudents/undergraduate/bioengineering\\_specialty.jsp](http://www.kettering.edu/futurestudents/undergraduate/bioengineering_specialty.jsp)

<sup>1</sup>Approximately one-half of the students take MECH-100 FR-I and IME-100 FR-II, the other one-half take IME-100 FR-I and MECH-100 FR-II.

<sup>2</sup>Approximately one-half of the students take MECH-300 JR-II and MECH-311 JR-I, the other one-half take MECH-311 JR-II and MECH-300 SR-I.

<sup>5</sup>Students select a Specialty Related Elective with approval of their M.E. Specialty Advisor.

<sup>8</sup>Elective courses may vary in lecture and/or laboratory credits and terms from those shown.