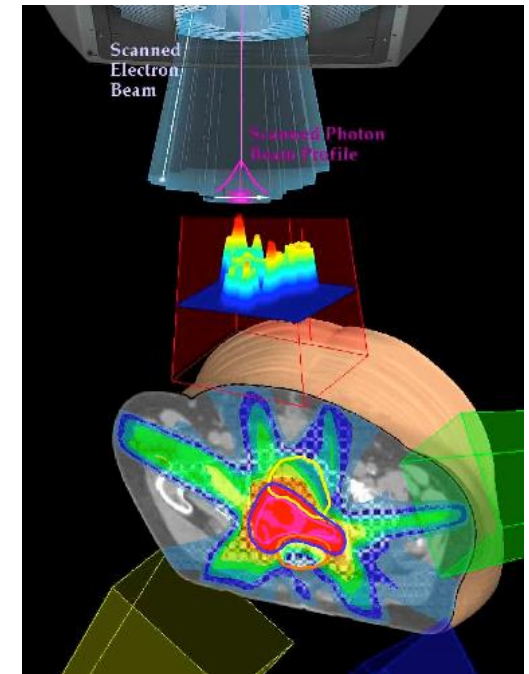
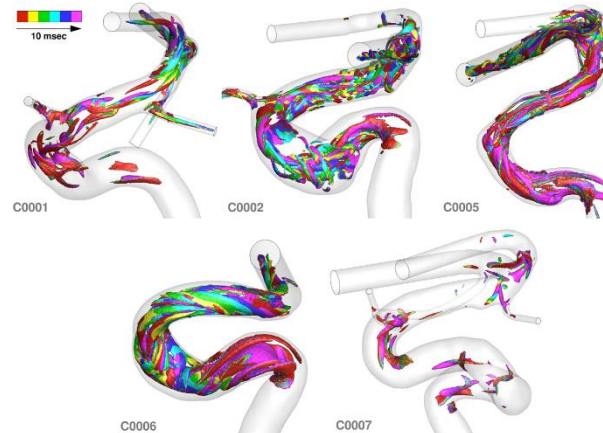
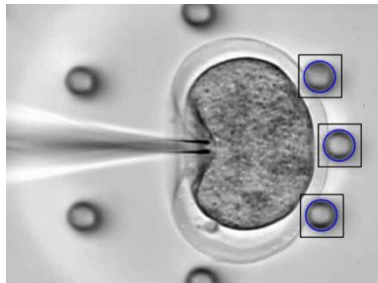
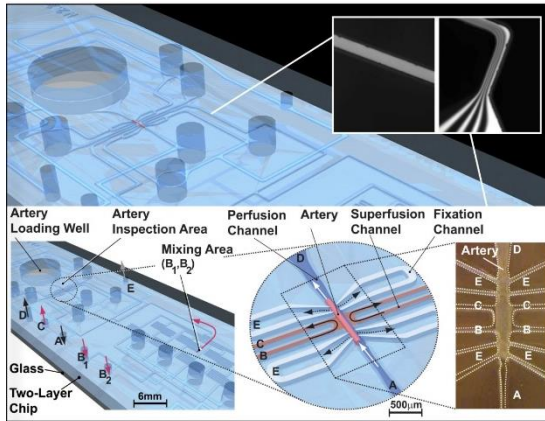


# Mechanical & Industrial Engineering Course and Option Talk - **Bioengineering**

**Bioengineering:** Application of the methods of engineering, physical sciences, and mathematics to solve problems in clinical and life sciences; and use of the principles and techniques of the life sciences in engineering.



# 3<sup>rd</sup> Year Curriculum Overview

## FALL

- MIE301: Kinematics and Dynamics of Machines
- MIE312: Fluid Mechanics I
- MIE342: Circuits with Applications to Mechanical Engineering Systems
- MIE258: Engineering Economics and Accounting
- Natural science requirement: **CHE353 Engineering Biology**

## WINTER

- MIE315: Design for the Environment
- MIE313: Heat and Mass Transfer
- MIE334: Numerical Methods I
- Two stream option courses: **CHE354 Cellular and Molecular Biology or MIE331 Physiological Control Systems**

# 4<sup>th</sup> Year Curriculum Overview

## FALL

- MIE491: Capstone Design
- Two stream option courses: MIE520 – **Biotransport Phenomena**
- One Technical Elective
- Other: HSS or CS Elective

## WINTER

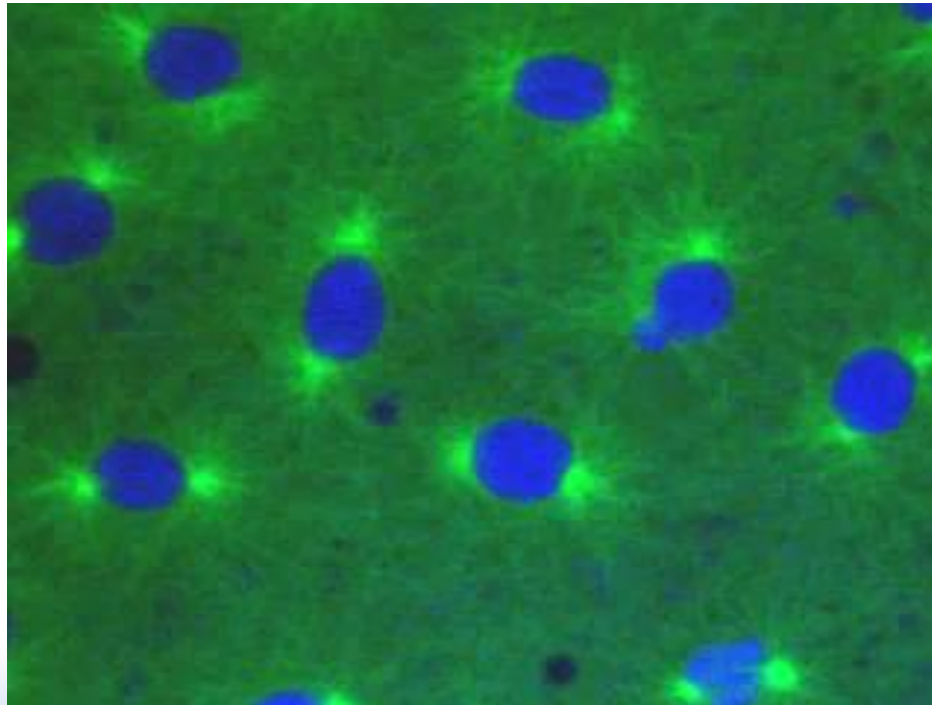
- MIE491: Capstone Design
- Three Technical Elective courses
- Other: HSS or CS Elective

**Biomedical Engineering Minor: 6 courses, some of which are Stream courses**

# Bioengineering– Core Courses

## 3F Term – CHE353 – Engineering Biology (req'd)

Quantitative, modelling-based problem solving approach to basic concepts in cell biology and physiology, including cell growth and metabolism, transport across cell membranes, protein structure, homeostasis, nerve conduction and mechanical forces in biology.



# Bioengineering– Core Courses

## 3S Term – **CHE354 – Cellular and Molecular Biology**

Principles of the biochemical and molecular inner workings of the cell. For students interested in environmental microbiology, biomaterials, tissue engineering, and bioprocesses.

**OR**

## 3S Term – **MIE331 – Physiological Control Systems**

Linear control theory applied to explain how neuromuscular, cardiovascular, and endocrine systems operate in a healthy human body.

**3S Term – CHE354 – Cellular and Molecular Biology**

## 3S Term – MIE331 – Physiological Control Systems



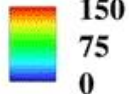
# Bioengineering– Core Courses

## 4F Term – MIE520 – Biotransport Phenomena

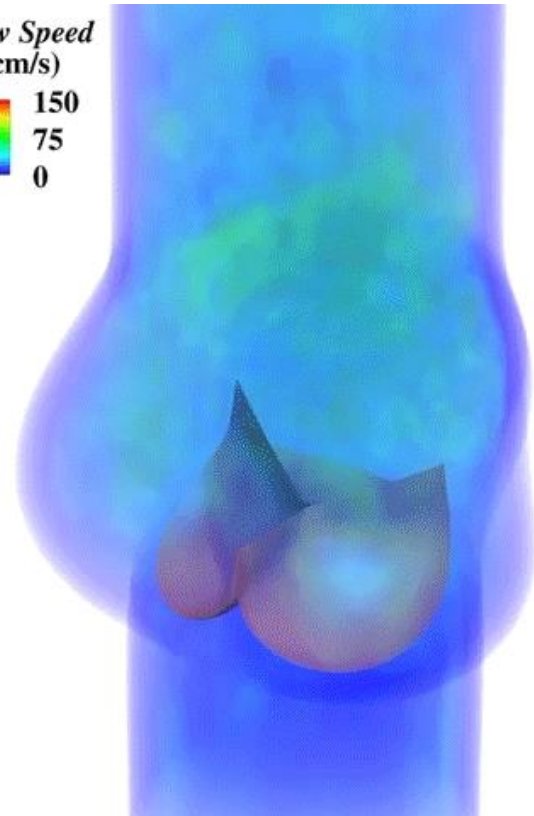
Mass transfer, heat transfer, and fluid flow applied to biological systems, including blood and gas flow in organs and organisms.



Flow Speed  
(cm/s)

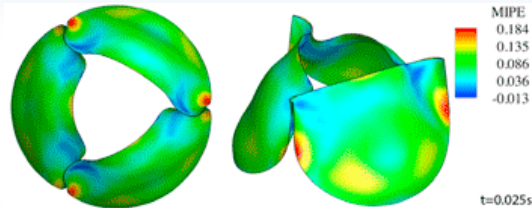
A vertical color scale legend for flow speed. It shows a gradient from blue at the bottom to red at the top, with intermediate colors of green and yellow. The values 0, 75, and 150 are marked next to the scale.

150  
75  
0



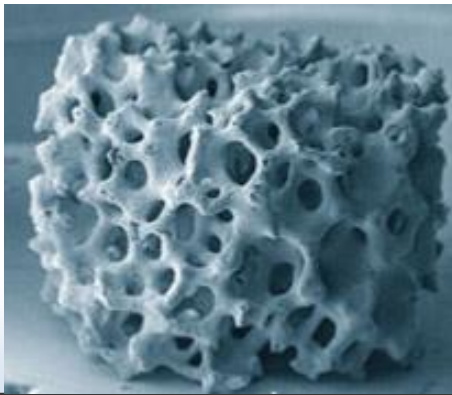


# Notable Technical Electives



## **MIE439** – Biomechanics

Application of the principles of solid mechanics, fluid mechanics, and dynamics to cells and organ systems.



## **CHE475** – Biocomposites

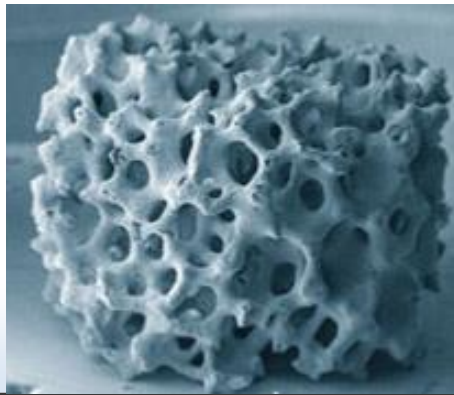
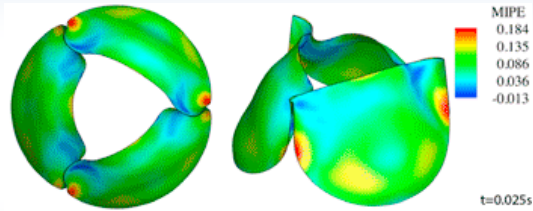
Structure, processing and application of natural and biological materials, biomaterials for biomedical applications, and fibre-reinforced eco-composites.



## **BME595** – Medical Imaging

Principles of medical imaging and physics, including magnetic resonance, ultrasound, and x-rays.

# Notable Technical Electives



of solid mechanics, fluid  
cells and organ systems.

ification of natural and  
als for biomedical  
ed eco-composites.

and physics, including  
nd, and x-rays.

# Bioengineering Opportunities

From the US Bureau of Labor Statistics Occupational Outlook Handbook 2008-2018:

Table 1. Occupations with the fastest growth

Table 1. Occupations with the fastest growth

Occupations	Percent change	Number of new jobs (in thousands)	Wages (May 2008 median)	Education/training category
Biomedical engineers	72	11.6	\$ 77,400	Bachelor's degree
Network systems and data communications analysts	53	155.8	71,100	Bachelor's degree

Athletic trainers	37	6.0	39,640	Bachelor's degree
Physical therapist aides	36	16.7	23,760	Short-term on-the-job training

## Job opportunities after graduation:

- Medical device industry
- Biotechnology industry
- Human factors/ergonomics
- Consulting
- Research laboratory
- Graduate school
- Medical school

# Questions

- Undergrad office
- Craig Simmons – [c.simmons@utoronto.ca](mailto:c.simmons@utoronto.ca)
- Other ME faculty in biomedical engineering:  
Amon, Behdinan, Ben Mrad, Diller, Guenther,  
James, Liu, Mandelis, Naguib, Nejat,  
Steinman, Sullivan, Sun, You, Young