THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Cell & Tissue Mechanics

BIOMEDE 5470

Credit Hours:
3.00 - 3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
This course will focus on the application of mechanics to biological cells and tissues. We will explore experimental methods used to measure mechanical properties of cells and tissues and mathematical models used to interpret experimental observations of cell and tissue mechanics. Computational mechanics and FE models will be used to investigate cell and tissue mechanics.

Prerequisites and Co-requisites:
Prereq: 4410, and MechEng 2040, and Sr standing; or Grad standing; or permission of instructor.

Course Goals / Objectives:
- Describe basic guidelines for modeling the biomechanical properties of cells and tissues and the common types of models used in biomechanics
- Analyze lumped-parameter models of tissue viscoelasticity
- Use composite theory to calculate the effective elastic modulus of the heterogeneous tissues and extracellular matrix
- Describe the linear and non-linear mechanical properties of the cytoskeleton
- Describe the experimental techniques used to characterize cell and tissue mechanics
- Analyze experimental data obtained from AFM based measurements of cell mechanics
- Use complex numbers to derive the frequency dependence of the cell?s storage and loss moduli
- Read and understand current literature in the field of cell and tissue mechanics
- Use computational modeling to investigate hypothesis generated from the current literature

Course Topics:
- Introduction to Cell mechanics
- Application of mechanics to cell biology
- Statistical mechanics
- Biofilaments (Ropes and Rods)
- 2D networkds and entropic elasticity
- Tensegrity models and 3D netowrks
- Viscoelastic models
- Mechanics of Biomembranes
- Measurements of cell mechanics
- Membrane Energetics and simple cell shapes
- Cell Motility and Filament Dyanmics
- Mechanotransduction
- Student Presentations

Designation:
Elective