



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Introduction to Microfluidics and Nanofluidics

BIOMEDE 5663

Credit Hours:

3.00 - 3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Lab

Course Description:

Principles of incompressible fluid mechanics and electrokinetic phenomena at the micro and nanoscale; biomedical applications with a laboratory illustrating fabrication techniques and experimental methods.

Prerequisites and Co-requisites:

Prereq: MechEng 3503 or equiv, or Grad standing, or permission of instructor.

Course Goals / Objectives:

- Derive the fundamental equations of fluid flow in micro-/nanofluidic systems for pressure driven flow
 - Derive the fundamental equations of fluid flow in micro-/nanofluidic systems for electrokinetic flow
 - Explain the effects of shear forces on biomolecules and derive equation that provide the amount of shear on biomolecules in flow systems
 - Explain the use of micro/nanofluidic systems for biochemical analysis systems
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Course Topics:

- Definition of a fluid Stress in a fluid Internal viscous flow
 - Fluid slip Mass transfer fundamentals
 - Electrostatics Electrolyte solutions Electrical double layer
 - Basics of biophysical chemistry Types of biomolecules and biomolecular structure, esp. DNA and proteins
 - Diagnostics of biofluids
 - Electrokinetic phenomena: electroosmosis and electrophoresis
 - Introduction to microfabrication, advanced fabrication, and nanofabrication methods
 - Experimental techniques for nanochannels flows (capillary filling, pressure filling, device packaging)
 - Flow characterization in microchannels and nanochannels (I-V measurements, fluorescence)
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Designation:

Elective