



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Introduction to Microfluidics and Nanofluidics

MECHENG 6515

Credit Hours:

3.00 - 3.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture

Lab

Course Description:

Principles of incompressible fluid mechanics & electrokinetic phenomena at the micro & nanoscale; biomedical applications with a laboratory illustrating fabrication techniques & experimental methods. Undergrad students encouraged to seek permission.

Prerequisites and Co-requisites:

Prereq: 3503 or 3504 (504) or equiv, or Grad standing in Engineering, or permission of instructor.

Course Goals / Objectives:

- Be able to derive the fundamental equations of fluid flow in micro-/nanofluidic systems for pressure driven flow
 - Be able to derive the fundamental equations of fluid flow in micro-/nanofluidic systems for electrokinetic flow
 - Be able to explain the effects of shear forces on biomolecules and derive equations that provide amount of shear on biomolecules in flow systems
 - Be able to 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 Electric double layer
 - Basics of biophysical chemistry Types of biomolecules and biomolecular structure, esp. DNA and proteins
 - Diagnostics of biofluids
 - Electrokinetic phenomena (electroosmosis, electromigration, electrophoresis)
 - Introduction to microfabrication, advanced fabrication, and nanofabrication methods
 - Experimental techniques for nanochannel flows (capillary filling, pressure filling, device packaging)
 - Flow characterization in microchannels and nanochannels (I-V measurements, fluorescence)
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Designation:

Elective