WASHINGTON STATE UNIVERSITY
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School of Engineering and Computer Science

Mech 435: Introduction to Microfluidics

Catalog Data:		**435 Introduction to Microfluidics** 3 Course Prerequisite: MECH 303, MATH 315. Overview of microfluidics, scaling laws, intermolecular forces, surface tension, passive scalar transport, electrowetting, electrokinetics, dielectrophoresis, microfabrication. Typically offered Fall.
Class Schedule:		Three 50-minute lecture sessions per week, for one semester.
Laboratory Schedule:		None
Prerequisites by Course:		MECH 303, MATH 315
Prerequisites by Topic:		1. Knowledge of fluid statics, laminar and turbulent flow, pipe flow, lift, drag and measurement techniques, fluid experimentations. 2. Linear differential equations and systems; numerical and qualitative approaches
Required Texts:		Brian Kirby, *Micro- and Nanoscale Fluid Mechanics: Transport in Microfluidic Devices*, Cambridge University Press, 2010
Course Coordinator:		Dr. Hua Tan
Course Objectives:		1. Understanding some advanced fluid mechanics relevant to micro scale device. 2. Design and analyze microfluidic devices. 3. Demonstrate a basic understanding of principle and processes of microfluidic device fabrication, testing and characterization. 4. Understanding lab-on-a-chip and the impact of microfluidics device for various engineering application. 5. Make reasonable decisions about the microfluidic device, selection, options and performance.
Topics Covered:		1. Concept of Microfluidics 2. Scaling law and continuum model, hydrodynamics of microfluidic 3. Pressure driven flow in microchannels, passive scalar transport and stokes flows 4. Electrokinetics, surface tension related microfluidics 5. Fabrication techniques 6. Microfluidic applications including Inkjet technology, microvalves, micropumps, micromixer, microreactor, etc.
Lab Experiments and Activities:		None
Course Outcomes:	Students will be able to:	
	Assessed for Student Outcomes	1-b. Classify microfluidic devices to identify functioning mechanisms defined in engineering problems. 1-c. Use appropriate physical models to solve the transport phenomena at the microscale. 7-b. Use proper learning strategies to examine the fabrication techniques for microfluidics. 7-c. Apply new knowledge to design microfluidic devices for a certain application.

	Other	1-a. Demonstrate understanding of various transport phenomena at the micro/nanoscale. 1-d. Apply the principles in fluid mechanics to solve fluid flow in microfluidics. 3-a. Write reports to describe the features and functions of novel microfluidics, using discipline-specific conventions including graph/tables, citations, etc. 3-b. Deliver well-organized and logical presentations related to microfluidics. 5-a. Develop project tasks and timeline with team members. 5-b. Contribute to the project effectively in a team.
Required or Elective Course:		Elective
Relationship of Course to Program:		Meets: Educational Objectives __1, 2, 3, 4_ Student Outcomes __1, 3, 5, 7
Prepared by:		Dr. Hua Tan — Date: 4/9/2018 (4/10/18 mb)
Approved by USC:		4/9/2018