## **Center for Environmental** & Applied Fluid Mechanics

 "Multiphase Flows for Energy Extraction: From Active-Biphasic Turbulence to Elastic Membranes in Fluid Flows"

- Varghese Mathai

University of Massachusetts

The interaction of deformable materials with fluid flows can result in a variety of emergent phenomena, many of them advantageous in engineering. In this talk I will present two multiphase flow systems where interfacial mechanics contribute to enhancements in thermal and mechanical energy extraction from fluid flows. In the first part, I will discuss flow modifications and transport heat enhancements that result from the introduction of a small fraction of millimetric, biphasic bubbles in a thermally driven turbulent flow. The roles of phase change and bubble kinematics in the transport processes will be discussed. In



the second part of the talk, I will discuss the fluid-structure interactions of a deformable (elastic) membrane in a uniform stream. I will show how an elastic membrane has many similarities to that of a bubbles. We reveal the mechanisms by which the membrane's elasticity, curvature and unsteady deformations could lead to an enhancement in hydrokinetic energy extraction or turbulence production. Potential benefits of using ultrasoft materials for flow control and energy extraction will be outlined.

Spring 2023 CEAFM Seminar Series March 3, 2023 × 3:00 PM × Gilman Hall 50