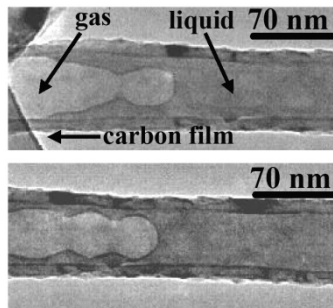


# COURSE ANNOUNCEMENT

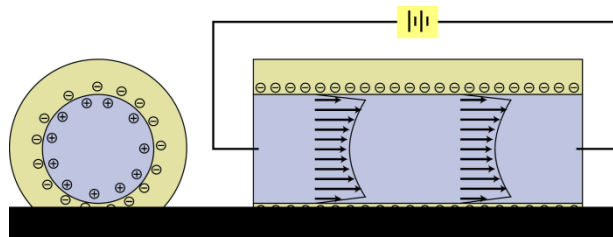
[Micro/Nanofluidics - 16513 - ME 69700 - 003](#)

## Micro and Nano Fluid Mechanics

Spring 2020, Tu/Th 4:30 pm - 5:45 pm, ME 1006



Gogotsi, et al.



Laser, et al.



Weigl, et al.

Microscopic flows are everywhere these days. In fact they've always been all around us but we haven't noticed. Despite their prevalence in science and engineering fields, they are not well understood—in large part because the fluid mechanics intuition developed in the study of macroscale flows frequently does not apply to microscopic flows. This class will prepare engineers and scientists to address problems they will encounter when studying the behavior of fluid flows in microscopic domains. The course will concentrate on behaviors not typically important at large length scales that become very important at small length scales, such as Van der Waals forces, surface tension, and electrostatic forces. The course will take a largely analytical approach to studying these flow phenomena although some computational modeling will also be performed and several lab demos and visits are planned. Previous experience with graduate level fluid mechanics (i.e. Navier-Stokes solutions) or continuum mechanics will be helpful. Some computational analysis of model problems may be performed using commercial software (ANSYS/Fluent/COMSOL or related).

**Instructor:** Steve Wereley, Mechanical Engineering ([wereley@purdue.edu](mailto:wereley@purdue.edu))

### Course Objectives:

1. To learn how fluids behave in microscopic domains that are still large enough for continuum flow approximations to hold.
2. To learn where the continuum assumptions are no longer valid.
3. To learn how to treat sub-continuum fluid flows.

**Prerequisites by Topic:** The student should be of graduate standing. The student should have had some previous experience with graduate level fluid mechanics, in particular solving the Navier-Stokes equations.

**Computer Usage:** The students may need to use ANSYS, Matlab, Fluent, COMSOL or a comparable package, to perform some of the computations necessary for the course.

**Assessment Methods:** Grades will be based on homework assignments, two projects, and a final exam. The relative weight of these components is 25%, 50%, and 25%, respectively.