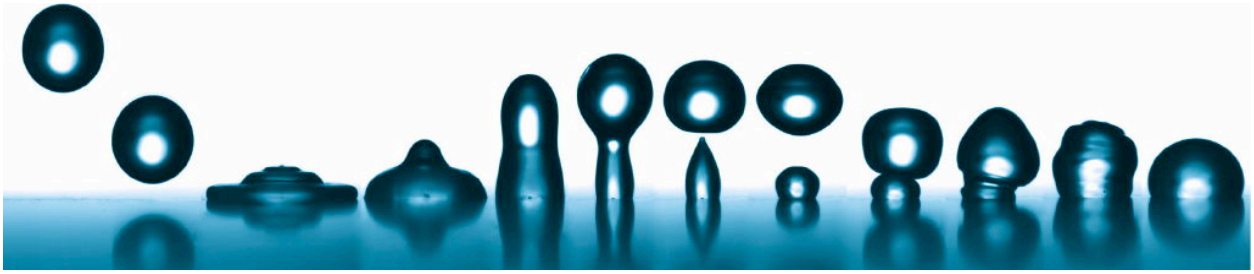
ME 537 Multiphase Flows
http://courses.washington.edu/mengr537
Class time: MWF 9:30 - 10:20 LOEW 206



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Course Description

This course is designed to provide students with a strong background on fundamental fluid mechanics the necessary understanding of the dynamics of multiphase flow to carry out research in their area of interest. Particular emphasis will be placed on bubble and particle dynamics, including sediment transport, cavitation, atomization and other environmental and industrial processes.

Although we will cover both Eulerian-Eulerian (two fluid) models and Eulerian-Lagragian (discrete particles) models, most of the material concentrates on the study of a discrete phase (particles, droplets or bubbles) in a continuous phase. Topics will include Basset-Boussinesq-Oseen equation of motion for a particle in a non-uniform flow, particle interactions with turbulence, inertial clustering, cavitation and bubble dynamics, droplet breakup, collisions and coalescence, surface tension effects.

SYLLABUS:

Week 0	Introductions, syllabus, course administration.
Week 1	Stokes flow around a spherical particle and Oseen correction.

Week 2	Equation of motion for a small spherical particle in a non-uniform flow, the Basset-Boussinesq-Oseen equation. Maxey and Riley, Physics of Fluids 26 (4) 1983.
Week 3	Other forces exerted by the carrier flow on a bubble/droplet/particle immersed in it. Saffman Lift, Bjerknes force, thermophoresis, etc.
Week 4	Particle dynamics. Inertial effects.
Week 5	Turbulence modulation by particles.
Week 6	Bubble dynamics.
Week 7	Cavitation.
Week 8	Two Fluid Models.
Week 9	Droplet breakup.
Week 10	Droplet collisions and coalescence.

References:

1. Crowe, C.T., Sommerfeld, M. and Yutaka, T. "Multiphase Flows with Droplets and Particles", CRC Press, Boca Raton, FL. 1998.

2. Crowe, C.T. "Multiphase Flow Handbook". Taylor & Francis, Boca Raton, Fl. 2006.

3. Brennen, C.E."Fundamentals of Multiphase Flow", Cambridge University Press, New York, 2005.

Grading

Homework	20%
Personal Project	40%
Midterm	15%
Final	25%