Math 6750/6880 – Fall 2017 – Spring 2018

# Fluid Dynamics I-II



**Description:** This course will be a full year sequence in which the equations for "simple" fluids like water and for "complex" fluids like yogurt will be derived and analyzed. The dynamics of simple fluids are described by the Navier-Stokes equations which were derived in the 19th century and are based on a linear relationship between stress and the fluid's rate of strain. These equations have proved extremely useful for understanding and predicting the behavior of fluids such as water or air, which consist of large ensembles of small molecules, over a wide range of conditions and in many technologically important applications. Complex fluids typically contain large molecules such as polymers whose mechanical properties affect the overall fluid dynamics. They are the subject of increasingly intense research because of their occurence in biology (e.g., the mucus layer coating the airways of the lungs) and their utility in technological applications such as textile production and printer ink. Complex fluids can have behaviors very different from those of simple fluids and present new and fascinating mathematical challenges.
The course will begin with the derivation of the Navier-Stokes equations for simple fluids. After that, treatment of simple and complex fluids will be intertwined in a manner illustrating their commonalities and differences.

**Prerequisites:** The course is intended both for students who have no prior experience with fluid dynamics and for students who have had an introductory course in fluid dynamics but little experience with complex fluids. Students who have already taken Math 6750 should register for this course as Math 6880 - Special Topics in Applied Mathematics – Fluid Dynamics I.
A background in PDEs at the level of Math 5440 is assumed.

**When & Where:** MWF, 10:45-11:35am, JWB 208.

**Instructors:** Aaron Fogelson (`fogelson@math.utah.edu`) and Christel Hohenegger (`choheneg@math.utah.edu`)

**For more info:** `http://www.math.utah.edu/~choheneg/fluids`