# FLUID MECHANICS I

INSTRUCTOR: SHRAVAN HANASOGE

## Learning Objectives

Students who take this class can expect to

- develop an appreciation for the properties of Newtonian fluids,
- study analytical solutions to variety of simplified problems,
- understand the dynamics of fluid flows and the governing non-dimensional parameters,
- apply concepts of mass, momentum and energy conservation to flows,
- grasp the basic ideas of turbulence.

## Curriculum

The following topics will be covered (there may be deviations from this)

(1) Hydrodynamic limit - deriving fluid equations
(2) Mass, momentum and energy conservation
(3) Euler's and Bernoulli's equations for inviscid fluid equations
(4) Streamfunctions for incompressible flows and exact solutions
(5) Irrotational flow and velocity potential formulation
(6) Vorticity dynamics
(7) Boundary layers and viscosity
(8) Introduction to multi-scale turbulence
(9) Transport in turbulent flows

## Textbooks

- Fluid Mechanics by Piyush Kundu: http://tberg.dk/books/Fluid_Mechanics.pdf
- Other notes will handed out in class

## Assessment Strategy

- Fortnightly assignments (30 %)
- Course participation (10 %)
- Mid-semester examination (30 %)
- Final project (30 %)

The percentages denote fractions that each of these course components will contribute towards the final grade.

## Contact Information

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## Guest speakers

This semester (Aug - Nov 2014), the Department of Astronomy and Astrophysics will have the pleasure of hosting a number of distinguished visitors, among whom are fluid-mechanics luminaries Prof. Katepalli Sreenivasan and Prof. Uriel Frisch. We hope to have 2-3 standard class lectures be delivered by them to give students exposure to deep ideas in theoretical and experimental fluid mechanics.