Fluid Mechanics Through Pictures

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In the course, fundamental concepts in fluid mechanics will be explained mainly using pictures and videos. The emphasis will be on the physical understanding with minimum use of equations. Topics that will be covered:

1) Nature of fluid. Continuum hypothesis. Introduction to pressure. Fluid statics
2) Kinematics. Concept of fluid element. Advection and substantial derivative.
3) Forces in a fluid.
4) Integral analysis: continuity, momentum, energy equations
5) Inviscid flow. Potential flow. Bernoullis equation.
6) Viscous flow. Couette, channel, pipe flows. Low Reynolds number flows.
7) Diffusion of momentum. Stokes 1st problem. Boundary layers and boundary layer separation.
8) Instability and transition. Turbulent flows: jets, wakes, mixing layers.
9) Forces on bodies: drag and lift. Bluff and streamlined bodies. Airfoil and wing theory.
10) Brief introduction to supersonic flows, buoyancy driven flows.
11) Interesting phenomena in fluid mechanics: vortex rings, Coanda effect etc

The course will include a mini project.